

Addendum to the User's Guide for MPTR

Aerocomp, Inc., Costa Mesa, CA

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ADDENDUM TO THE USER'S GUIDE FOR MPTR

by

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ABSTRACT

This addendum applies to the "User's Guide for MPTEP -- A Multiple Point Gaussian Dispersion Algorithm with Optional Terrain Adjustment" of Pierce and Turner, 1980. While the cited document describes the features of the MPTEP model, its technical basis, and applications, this addendum deals exclusively with algorithm modifications to accommodate new knowledge and technique as well as address recommendations of the "Guideline on Air Quality Models." The Guideline lists MPTEP as a preferred model for calculating concentrations due to point sources at averaging times from one hour to one year in rural or urban areas where the terrain is flat or gently rolling and pollutant transport distances are less than 50 kilometers.

MPTEP is a Gaussian steady-state model applicable to relatively nonreactive pollutants emitted from one or more point sources which impact receptors in level or rolling terrain. The model contains stability-dependent terrain-adjustment factors to simulate the impact on nearby terrain provided the point of impact is no higher than the elevation of the lowest stack top. Calculations use a meteorological data set with hourly wind direction, wind speed, temperature, stability class, and mixing height. Meteorological conditions are assumed to remain constant throughout each simulation hour; in particular, the input wind vector is assumed to represent flow field throughout the modeling region. Source input parameters include emission rate, stack height, stack exit diameter, temperature of the effluent, and exit velocity.

The original version of the model offered options for stack-tip downwash, gradual plume rise, and buoyancy-induced dispersion. Added to this release (UNAMAP Version 6) are options that allow selection of either rural or urban dispersion parameters and wind-profile exponents. To address model over-prediction when wind speeds are low, an algorithm for the treatment of calms has been added. Also new in this release is a default option to set parameters for regulatory applications as suggested by the Guideline. These are: final plume rise, rather than gradual rise, is used and buoyancy-induced dispersion and momentum plume rise are considered, as are calm conditions.

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ADDENDUM TO THE USER'S GUIDE FOR MPTEr

MPTEr (Multiple Point source model with TErRAIN adjustment) was developed by the Environmental Protection Agency (EPA) in 1979 to estimate air quality concentrations of relatively non-reactive pollutants from multiple sources with adjustments made for slight terrain differences (Pierce and Turner, 1980). The model was first released as part of the User's Network for Applied Modeling of Air Pollution (UNAMAP) Version 4, and re-released with minor modifications in UNAMAP Version 5. This addendum provides a complete description of the MPTEr revisions and outlines the modifications required for updating the user's guide and the earlier versions of the FORTRAN source code to result in the code included in UNAMAP (Version 6).

SUMMARY OF MODIFICATIONS

Important features added to the MPTEr model are as follows:

- o Urban and rural modes, for wind-profile exponents and dispersion parameters,
- o Treatment of calm conditions according to methods developed by EPA (1984), and a
- o Default option, primarily for regulatory application.

These features were designed to satisfy the requirements outlined in "Guideline on Air Quality Models (Revised)" (EPA, 1986). The default option feature is designed as a convenience for the user to avoid inadvertent errors in setting the appropriate options for regulatory applications. The reader is cautioned to refer to the current regulatory guidance contained in EPA's "Guideline on Air Quality Models" and to confer with the appropriate regional meteorologist when this model is being used to satisfy regulatory requirements. With the addition of the above features, the model is acceptable for regulatory applications and is considered a guideline model by the EPA. The revisions are discussed in greater detail next; user's guide and computer code modifications follow the revisions.

The numerical values in the original test case output remain unchanged.

Urban and Rural Modes

Separate urban and rural default wind-profile exponents were added to MPTEr and are presented in Table 1. These exponents are used by the model when the user exercises the default option. The rural exponents correspond to a surface roughness of about 0.1 meters; the urban exponents result from a roughness of about 1 meter (plus urban heat release influences). For a more detailed discussion of wind profiles, the reader is referred to Irwin (1979).

TABLE 1. DEFAULT URBAN AND RURAL WIND-PROFILE EXPONENTS

Mode	Stability class					
	A	B	C	D	E	F
Urban	0.15	0.15	0.20	0.25	0.30	0.30
Rural	0.07	0.07	0.10	0.15	0.35	0.55

An urban dispersion algorithm has been added to the rural scheme in the original MPTER. The urban dispersion parameter values are those recommended by Briggs and included in Figure 7 and Table 8 of Gifford (1976).

The urban or rural setting is indicated by the user via input variable MUOR on card 4.

Treatment of Calm Conditions

When the default option is exercised, calm conditions are handled according to methods developed by the EPA (1984) which are summarized here. A calm hour is indicated by an hour with a wind speed of 1.0 m/sec and a wind direction equal to that of the previous hour. When a calm is detected in the meteorological data, the concentrations at all receptors are set to zero, and the number of hours being averaged is reduced by one, except that the divisor used in calculating the average is never less than 75 per cent of the averaging time. For any simulation, this results in the following:

- o 3-hour averages are determined by dividing the sum of the hourly contributions by 3;
- o 8-hour averages are calculated by dividing the sum of the hourly contributions by the number of non-calm hours or 6, whichever is greater;
- o 24-hour averages are determined by dividing the sum of the hourly contributions by the number of non-calm hours or 18, whichever is greater; and
- o Period of record averages, regardless of length, are calculated by dividing the sum of all the hourly contributions by the number of non-calm hours during the period of record. This is the only exception to the 75 per cent rule.

This calms procedure is not available in MPTER outside of the default option. The user can employ this procedure, however, through the use of the CALMPRO postprocessor program (EPA, 1984). CALMPRO is available as part of UNAMAP Version 6.

Default Option

An option has been added to the model to facilitate compliance with regulatory requirements. Exercising the default option (i.e., IOPT (25) = 1) overrides other user-input selections and results in the following:

- o Final plume rise is used (gradual or transitional plume rise is not exercised for plume height, but is used to calculate the magnitude of the buoyancy induced dispersion),
- o Buoyancy induced dispersion is exercised,
- o Terrain adjustment factors are set to zero for all stabilities,
- o Stack tip downwash (Briggs, 1974) is considered,
- o Default urban or rural wind profile exponents are used (See Table 1), and
- o Calms are treated according to methods developed by the EPA (1984) as noted previously.
- o Decay half-life is set to 4.0 hours for SO₂ for the urban option, and infinite half-life (no decay) for all other cases.

Other Features

There are several additional regulatory features that are inherent in the UNAMAP Version 5 and later versions of MPTER. These are summarized below.

- (1) Momentum plume rise is always considered.
- (2) Terrain adjustments are used for receptors below stack base elevation in the same manner as elevated receptors. The difference, defined as the receptor ground level elevation minus source ground level elevation, is computed and subtracted from the effective plume height. This has the effect of raising the plume at receptors below the source ground level elevation and lowering the plume at receptors above the source ground level elevation.
- (3) Mixing height is compared with the final plume height without regard to plume height changes due to terrain.
- (4) Exponential decay (half-life) is available if required by the simulation.

USER'S GUIDE MODIFICATIONS

The modifications to the User's Guide for MPTER by T. E. Pierce and D. B. Turner (1980) (EPA-600/8-80-016) are summarized next. All the replacement pages for the User's Guide are provided in Appendix A.

- PAGES 1 and 2 -- The Executive summary is modified to reflect changes made to the MPTER source code. The urban dispersion parameter scheme and default option are included in the discussion.
- PAGE 6 -- An urban/rural switch is added to the control requirements.
- PAGE 7 -- The urban/rural modes and default option are added to the discussion in the first paragraph.
- PAGE 9 -- The urban/rural modes and the urban dispersion parameter scheme are added to the discussion in the fourth paragraph.
- PAGE 12 -- "P-G" as a modifier for "dispersion parameters" is no longer adequate since the addition of the urban dispersion parameter scheme (Gifford, 1976). "P-G" is deleted from the discussion in the second paragraph.
- PAGE 14 -- "P-G" is deleted from the discussion in the second paragraph.
- PAGE 17 -- The second paragraph and Table 1 are modified to include mention of the urban wind profile exponents.
- PAGE 19 -- The urban dispersion parameter scheme is added to the discussion in the second paragraph.
- PAGE 22 -- "P-G" is deleted from the discussion in the last paragraph since it is no longer adequate.
- PAGE 26 -- The last paragraph is modified to reflect changes in the MPTER code; the executable program now requires 56 K of core memory. Also, table 2 is deleted.
- PAGE 31 -- Section 6.2.1.9 is modified to reflect the code revisions (i.e., urban/rural modes and default option). Section 6.2.1.10 is added to the text and discusses the urban/rural switch, MUOR. It is now an input data requirement.
- PAGE 34 -- The discussion in Section 6.2.3 is modified to reflect that there are now five technical options.
- PAGE 36 -- Section 6.2.3.1.5 is added to the text and discusses the default option.

- PAGE 50 -- Variable MUOR (i.e., urban/rural swith) is added to Table 6.
- PAGE 51 -- Variable IOPT (25) (i.e., the default option) is added to Table 7.
- PAGE 64 -- Variables NDAY and IHR are added to Table 23.
- PAGE 145 -- "Guideline on Air Quality Models (Revised)" 1986 has been added to the list of references.
- PAGES 150 -- The description of the plume rise algorithm is modified to re-
through
154 reflect changes in the code.

REFERENCES

- Briggs, G. A. 1974. Diffusion Estimation for Small Emissions. In: ERL, ARL USAEC Report ATDL-106. U. S. Atomic Energy Commission, Oak Ridge, TN. 59 pp.
- Gifford, F. A. 1976. Turbulent diffusion-typing schemes: a review. Nucl. Saf. 17: 68-86.
- Irwin, J. S. 1979. A theoretical variation of the wind profile law exponent as a function of surface roughness and stability. Atmos. Environ. 13: 191- 194.
- Pierce, T. E. and Turner, D. B. 1980. User's Guide for MPTR A Multiple Point Gaussian Dispersion Algorithm with Optional Terrain Adjustment. EPA-600/8-80-016, U. S. Environmental Protection Agency, Research Triangle Park, NC 27711. 247 pp.
- U. S. Environmental Protection Agency. 1984: Calms Processor (CALMPRO) User's Guide. EPA-901/9-84-001. U. S. Environmental Protection Agency, Region I, Boston, MA 02203.
- U. S. Environmental Protection Agency. 1986: Guideline on Air Quality Models (Revised) EPA 450/2-78-027R, U. S. Environmental Protection Agency, Research Triangle Park, NC 27711.

APPENDIX A
REPLACEMENT PAGES FOR USER'S GUIDE

Portions of the original document should be replaced with the pages that follow. Where more than one page replaces a single one, the additions have the same page number plus a letter. With the revised pages inserted, the user's guide is a complete and technically accurate description of the modified MPTER model as released in UNAMAP Version 6.

All revised portions of the user's guide appear in light italic print.

EXECUTIVE SUMMARY

The MP_{TER} computer code (Multiple Point source model with TERrain adjustments) provides a method to estimate air pollutant concentrations from multiple sources in rural or urban environments, and can make optional adjustments for slight terrain variations.

The algorithm is based upon Gaussian modeling assumptions and incorporates the Pasquill-Gifford (P-G) dispersion parameter values for rural settings and the dispersion parameter scheme recommended by Briggs for urban situations, see Figure 7 and Table 8 of Gifford (1976). However, several technical options and various parameter values may also be entered as input. MP_{TER} may be considered a research tool for exploratory use of various assumptions and parameter values, as well as a standardized model for more routine impact analyses.

The version of MP_{TER} (85165) released with UNAMAP 6 includes a default option which allows the user to set the model for regulatory applications. When the option is employed, the model satisfies the requirements outlined in the "Guideline on Air Quality Models (Revised)" (EPA, 1986) for most applications. The default option is provided as a convenience for the user, to help avoid inadvertent errors in setting the appropriate options. The user is cautioned to refer to the current regulatory modeling guidance in EPA's "Guideline on Air Quality Models (Revised)" and to confer with the appropriate regional meteorologist.

MP_{TER} can estimate the resulting concentrations at a maximum of 180 receptors from a maximum of 250 point sources. Gaussian assumptions and techniques are used to perform the estimates hourly, considering each hour as a steady state period. Required input information consists of point source and hourly meteorological data. Periods from one hour to one year may be simulated, with all output controlled by the user through the selection of options.

Features of the algorithm include:

- o Averaging periods of longer than 1 hour, if selected by user.
- o Hourly meteorological data that may be read off punched cards for each hour, or from tape (or disk) containing a year's data (same data as used for RAM or CRSTER).
- o An optional terrain adjustment as a function of stability class.
- o Inclusion or omission of stack downwash.
- o Inclusion of gradual plume rise, or final rise only.
- o Inclusion or omission of buoyancy-induced dispersion of pollutant at the source using the method of Pasquill.
- o Input of anemometer height.
- o Input of wind profile power law exponents as functions of stability.
- o Concentration contributions that are available per hour and/or for the selected averaging period at each receptor from up to 25 sources.
- o Concentrations available hourly and/or for the selected averaging period at each receptor.
- o Optional output of the following information: average concentration over length of record, plus highest five concentrations for each receptor for four averaging times (1-, 3-, 8-, and 24-hour); and an additional averaging time selected by the user.
- o Optional output files for further processing of concentrations that are available per hour and for each averaging period.
- o *Option for setting default values for regulatory applications.*
- o *Choice of urban or rural settings.*

CONTROL DATA

The following control information is needed for a run. Some additional information, to be discussed later, may be required depending upon options selected. Control information needed includes:

- Headings (for output)
- Year
- Starting Julian Day
- Starting Hour
- Number of averaging periods to be run
- Number of hours in each averaging period
- Code for selecting the pollutant for this run (sulfur dioxide or particulate)
- Mode of simulation (urban or rural)*
- Number of significant sources (used for contribution to concentration from individual sources)
- Additional averaging time for high-five table (explained later)
- Conversion for user units (east and north coordinates)
- Conversion for user height units
- Half-life of pollutant used in this run
- Values to select each option
- Anemometer height
- Wind profile power law exponents (one for each stability)
- Terrain adjustments, if used (one for each stability)

Further discussion of input data is given in Chapter 7.

SECTION 3

RECOMMENDATIONS

USES

As stated in the introduction, MPTER is a multiple point source dispersion model for *urban or rural* situations. Because optional adjustments can be made for slight terrain variations, careful study of model inputs is required to ensure the user's problem is addressed, and to provide proper output for the problem at hand. *The model may also be applied to impact analyses in response to regulatory requirements by selecting the default option which sets certain features, overriding other user-input selections as required.*

Its versatility allows MPTER to function as both a tool for research and for more routine impact analysis. In research, numerous parameter variations can be explored for comparisons with measured air quality data, and various sensitivities can be determined.

A frequent use of the model will be to assess air pollutant impact to compare with National Ambient Air Quality Standards. Since the short-term standards are not to be exceeded more than once a year, extremes of the frequency distribution must be determined. Brute force approaches may be required to estimate these extremes through calculation of a full year's data, as is done by CRSTER. Receptor locations are input by the user, except when the model's option is used for generating a polar coordinate set of receptors centered in a specific location.

Determining appropriate receptor locations where maximum impact might be expected is a difficult user problem. Little guidance is available for selecting optimum receptor positions, but the following three steps may prove helpful: 1) use screening methods to locate distances to maxima; 2) at these distances, use polar coordinate locations about each source of significance, analyzing a year's or more meteorological data, and then 3) make estimates

ASSUMPTIONS

The foundation of MPTER, including much of its computer code, is the point source portion of RAMR.

Gaussian Modeling

The following assumptions are made: 1) continuous plumes are diluted upon release by the wind speed at stack top; 2) dispersion from continuous plumes results in time averaged Gaussian distributions in both the horizontal and vertical directions through the dispersing plume; 3) concentration estimates may be made for each hourly period using the mean meteorological conditions appropriate for each hour; 4) the total concentration at a receptor is the sum of the concentrations estimated at the receptor from each source, i.e., concentrations are additive; and 5) concentrations at a receptor for periods longer than an hour can be determined by averaging the hourly concentrations over the period.

The upwind distance x and the crosswind distance y of the source from the receptor is determined as a function of the mean hourly wind direction. Dispersion parameter values are determined as functions of stability class and upwind distance. Equations to estimate concentration are selected dependent upon stability class, and, for neutral or unstable conditions, upon the relation of dispersion parameter value to mixing height (see Appendix A). The location of the receptor relative to the plume position is a dominant factor in the magnitude of the concentration.

Dispersion Parameter Values

The dispersion parameter values used for a particular run of MPTER depend upon the mode of simulation (either urban or rural). For the rural situations, a roughness of approximately 0.1 meters is assumed and the Pasquill-Gifford (P-G) parameters are employed. The urban dispersion parameter values are those recommended by Briggs and included in Figure 7 and Table 8 of Gifford (1976).

Except for stable layers aloft, which inhibit vertical dispersion, the atmosphere is treated as a single layer in the vertical that has the same rate of vertical dispersion throughout. Complete eddy reflection is assumed both from the ground and from the stable layer aloft, given by the mixing

Option 2: Stack Downwash

A second optional feature of MPTER is considerations of stack tip downwash using the methods of Briggs. In such an analysis, a height increment is deducted from the physical stack height before determining momentum or buoyancy rise. This option primarily affects computations from stacks having small ratios of exit velocity to wind speed.

Option 3: Gradual Rise

Gradual plume rise has been made an optional feature of MPTER, because although the use of the $x^{2/3}$ dependence for rising plumes will determine average plume height with distances quite well, the plume axis is not horizontal during the rising phase. Therefore, dispersion is taking place perpendicular to the bent-over plume axis rather than vertically. The dispersion parameters represent horizontal and vertical dispersion about a horizontal plume, which may not be appropriate for estimating dispersion of a rising bent-over plume. By making computations with and without the gradual plume rise, at least identification is possible of potentially high concentrations during the gradual plume rise phase. When gradual rise is not employed, computations are made using the final effective plume height.

Option 4: Buoyancy-Induced Dispersion

The final optional feature of MPTER is a method suggested by Pasquill (1976) for determining the buoyancy-induced dispersion in both the horizontal and vertical directions. This feature is offered because emitted plumes undergo a certain amount of growth during the plume rise phase, due to the turbulent motions associated with the conditions of plume release and the turbulent entrainment of ambient air. Such dispersion, however, will generally have little effect upon maximum concentrations unless the stack height is small compared to the plume rise.

be either clockwise or counterclockwise. Although surface wind direction may have little effect upon long-term concentrations (such as annual average) from single plants, and may not greatly alter estimates of extreme concentration values from such a source, use of surface wind direction to determine plume transport direction usually causes large errors in hour-to-hour estimates. This potential error is a very important consideration if attempting to compare air quality measurements with the model estimates. The error is also important in considering interactions of several sources where actual wind directions are significant in determining the location of a plume from a source passing over another source.

Since the *dispersion parameters are based upon P-G stability classes*, the fact should be recognized that a change of only one stability class for input will cause large changes (factors of 5 to 10) in concentration at a receptor. Such changes are especially likely if the receptor is closer to the source than the distance to maximum concentration.

Other potential causes of large inaccuracies in concentration at a given point include wind speed errors, wind speed profile power law exponents that differ from actual variations, and nonrepresentative stability classes. However, if the user is searching for maximum impact and is relocating receptors in order to find such maxima, there will be considerably less sensitivity to wind speed differences and power law exponents, but still significant sensitivity to stability class.

Not included in this model are situations where wind speed varies markedly within the hour, whereby the effective plume height will fluctuate, causing increased vertical dispersion of the plume.

Maxima even at the extreme ends of the frequency distribution will tend to have more accuracy than hour-to-hour comparisons. Longer averaging times, such as annual concentrations, will also have less error than short averaging times. Background concentrations from sources not considered in the emission inventory may become more important for the longer averaging times.

where u_z is the input wind speed for this hour, z_a is the anemometer height, and the exponent p is a function of stability. If u_h is determined to be less than 1 m s^{-1} , it is set equal to 1.

Separate urban and rural default wind profile exponents are considered by MPTER and are shown below. These exponents are used by the model when the user exercises the default option. The rural exponents correspond to a surface roughness of about 0.1 meters; the urban exponents result from a roughness of about 1 meter (plus urban heat release influences). For a more detailed discussion of wind profiles, the reader is referred to Irwin (1979).

TABLE 1. DEFAULT WIND PROFILE POWER LAW EXPONENTS FOR THE URBAN AND RURAL MODES.

Stability	Urban Exponent	Rural Exponent
A	0.15	0.07
B	0.15	0.07
C	0.20	0.10
D	0.25	0.15
E	0.30	0.35
F	0.30	0.55

As stated in the previous chapter, directional shear with height is not included, which means that the direction of flow is assumed to be the same at all heights over the region. The taller the effective height of a source, the larger the expected error in direction of plume transport. Although the effects of surface friction are such that wind direction usually veers (turns clockwise) with height, the thermal effects (in response to the horizontal temperature gradient in the region) can overcome the effect of friction and cause backing (turning counterclockwise with height) instead of veering.

In the program RAMMET, which processes National Weather Service hourly observations, the wind directions (reported to the nearest 10°) are altered by a randomly generated number from 0 to 9 used to add -4° to $+5^\circ$ to the wind vector. An extreme overestimate of concentration

In ranking the point sources by the significance of their expected impact, only the rise due to buoyancy is processed, since it is expected to be the dominant plume rise factor. In the computation of the effect of each point source upon receptors for each simulated hour, however, all three of the above mentioned effects -- stack downwash, momentum plume rise, and buoyant plume rise -- can be considered. These computations are discussed in detail in Appendix B. Of note is that since wind speeds are not allowed to be less than 1 m s^{-1} , the stable buoyancy plume rise for calm conditions is not required and is therefore not included in the program code for MPTER.

DISPERSION PARAMETERS

The rural dispersion parameter values in MPTER are the P-G values (Pasquill, 1961; Gifford, 1960), which appear as graphs in Turner (1970) and in Gifford (Figure 2; 1976). The substitutions used to determine these open-countryside parameter values are the same as in the UNMAP program PTPLU (Pierce et al., 1982). The urban dispersion parameter values are those recommended by Briggs and included in Figure 7 and Table 8 of Gifford (1976).

Except for stable layers aloft that inhibit vertical dispersion, the atmosphere is treated as a single layer vertically, with the same rate of vertical dispersion throughout the layer. Complete eddy reflection is assumed both from the ground and from the stable layer aloft, which is given by the mixing height.

GAUSSIAN PLUME EQUATIONS

The upwind distance x of the point source from the receptor and the crosswind distance, y , of the point source from the receptor are calculated using Equations (A1) and (A2) in Appendix A, for each source-receptor pair per simulated hour. Both dispersion parameter values σ_y and σ_z are determined as functions of this upwind distance x and stability class.

One of the three equations is used to estimate concentrations under various conditions of stability and mixing height. Equation (A3) in Appendix A is used for stable conditions or for unlimited mixing; eddy reflection at the ground is assumed. For unstable or neutral conditions where vertical dispersion is so great that uniform mixing is assured beneath

$H_A = H$	for $F_T = 1$
$H_A = H - \Delta E$	for $F_T = 0$
$H_A = H - 0.7 \Delta E$	for $F_T = 0.3$
$H_A = H - 0.1 \Delta E$	for $F_T = 0.9$

The manner in which the terrain adjustment is simulated is depicted in Figure 1 for three values of the factor.

Of note to the user is that calculation of terrain adjustment is limited to receptors whose ground-level elevation is less than the elevation of the lowest stack top used in the run.

The terrain adjustment incorporated in MPTER is obviously simplistic. For the estimation of plume behavior in the vicinity of a single hill, the stable-plume fluid modeling studies of Hunt et al (1978) have shown the importance of the Froude number, and of the location of the receptor and the plume relative to hill base and top. None of these parameters is considered here, but rather the relation of the receptor and source ground-level elevations. The reader is therefore cautioned against assigning too great a significance to results obtained using the terrain adjustment option.

Option 2: Stack Downwash

A second optional feature of MPTER is consideration of stack tip downwash using the methods of Briggs. In such an analysis, a height increment is deducted from the physical stack height before determining momentum or buoyancy rise. Use of this option primarily affects computations from stacks having small ratios of exit velocity to wind speed.

Option 3: Gradual Rise

Gradual plume rise determination has been made an optional feature of MPTER, because although the use of the $x^{2/3}$ dependence for rising plumes will determine average plume height with distance quite well, the plume axis is not horizontal during the rising phase. Dispersion is thus taking place perpendicular to the bent-over plume axis rather than vertically. The dispersion parameters represent horizontal and vertical dispersion about a horizontal plume, which may not be appropriate

OUTHR - Subroutine which arranges and then prints tables of concentration. Number of tables that is output depends on the option combination specified.

RANK - Subroutine called by MPTER that ranks concentrations for four or five averaging times so that highest five concentrations are printed for each receptor.

ADDITIONAL COMMENTS

Figure 2 is an abbreviated flow diagram of MPTER showing its major loops and the relationships of the subroutines to each other and the main program.

The main program of MPTER primarily exists for input and bookkeeping; most technical calculations are performed by subroutine PTR. PTR calls subroutine RCP, which in turn obtains dispersion parameter values from subroutine PGYZ, then selects and solves the appropriate Gaussian equation. Subroutine RANK orders the highest five concentrations for each averaging time for each receptor. Subroutine OUTHR essentially provides the printed output.

The executable program for MPTER requires 56 K core on E22's UNIVAC 1110.

6.2.1.8 Pollutant Half-Life -- HAFI

An exponential loss of the considered pollutant with travel time is included in the model. At a travel time equal to the half-life, 50% of the pollutant will remain. Although this view of chemical or physical depletion processes is overly simplistic, it may be useful under certain circumstances. Note that the half-life is entered in seconds. If the user wants no depletion to be considered, entering zero for the half-life will cause skipping of those portions of the code calculating pollutant loss.

6.2.1.9 Values of Variables Related to Increase of Wind with Height--

The anemometer height in meters for the meteorological data used is entered on CARD TYPE 6. Six values for the wind profile power law exponent, one for each stability class, are also entered on CARD TYPE 6. Table 1 in Section 4 provides appropriate values for the urban and rural modes. For computations submitted in response to regulatory requirements, Option 25 should be used. Current regulatory guidance should be consulted (check with the appropriate regional meteorologist). This will automatically utilize the values listed in Table 1.

If Option 1 is employed to make terrain adjustments, six terrain adjustment factor values (one for each stability class) that are read in on CARD TYPE 6 are used in subsequent computations (see 6.2.3.1.1 below). The values must be real numbers between 0 and 1.

6.2.1.10 Urban/Rural Mode Indicator--

The urban or rural setting is indicated via input variable, MUOR. If MUOR = 1, then the urban dispersion parameter values recommended by Briggs and included in Figure 7 and Table 9 of Gifford (1976) are used; if MUOR = 2, then the P-G dispersion values are exercised. When the regulatory option is chosen (IOPT(25) = 1), MUOR also determines the set of wind profile power law exponents used (either urban or rural).

6.2.2 Input Data

Comments on emission, receptor, and meteorological data are made here.

6.2.2.1 Emission Data -- (See CARD TYPE 7)

The alphanumeric name and eight variables of point source information are the same as used in most dispersion models. Only one of the two emission rates will be used in a given run (see 6.2.1.3 above). If only one pollutant is of interest, the other field may be left blank. If Option 6 to enter hourly emission rates (see 6.2.3.2.2 below) is not used, the emission rates should provide the best estimate of the emission for the length of record being run. If maximum or design emissions are used, concentration estimates may be somewhat larger than actual concentrations. However, Irwin and

Users who want to make a run for a significant length of simulated time are thus advised that when employing the terrain adjustment option, they must first make a run for a short period (one hour -- meteorological data are unimportant) to see if double asterisks appear on the receptor list. Then these receptors should be eliminated before making the long-term run.

6.2.2.3 Meteorological Data -- (See CARD TYPE 14)

Meteorological data files prepared by the CRSTER Preprocessor or by the similar program from the RAM system, RAMMET, are acceptable by MPTER. Proper running of these preprocessor programs results in a one-year period of record with one record for each calendar day. Twenty-four values of each of the following parameters are contained in this record: Pasquill-Gifford Stability Class, wind speed (at anemometer height), ambient air temperature, wind flow vector (wind direction $\pm 180^\circ$), and mixing height. The user should be reminded that if using either of these programs to process meteorological data, a complete set of data must be input to either program. Any "holes" in the data set must be filled by the user. In using this data for input to MPTER one record is read for each simulated day. If making a run for a period of record of less than a year and starting after Day 001 (January 1st), MPTER will skip records to arrive at the proper day based upon the variable IDATE(2) on CARD 4 (see 6.2.1.4 above).

If using meteorological data from the preprocessed file, Option 5 will be zero. Also, the four variables on CARD TYPE 8 are to be read in and will be checked against the data on the input file.

Alternatively, when employing Option 5, meteorological data is read from punched cards (see CARD TYPE 14) with one record for each simulated hour in the run. The wind speed on this card again is for the anemometer height. The wind direction is the direction from which the wind blows.

6.2.3 Options

There are *five* technical options, four input options, 11 print options, and five other options either for control or for output to files. To employ a particular option, a 1 is entered as input to the element of the array IOPT with the same number as the option number. Otherwise, a zero is

plume rise using the techniques suggested by Pasquill (see Section 4). It should be pointed out that even if Option 3 is employed, resulting in use of only the final plume height for effective height of emission, the gradual plume rise is determined internally to determine the buoyancy-induced plume size. (It would not be the least bit appropriate to use the final plume rise to determine the initial size close to the stack).

6.2.3.1.5 Option 25: Set Defaults (used for regulator applications)--

The default option (IOPT(25) = 1) automatically sets several input features, overriding other user-input selections as required. Currently the default option sets features required for regulator applications. Exercising this option results in the following.

- o Final plume rise is used (gradual or transitional plume rise is not considered), that is, IOPT(3) is set to "1".
- o Buoyancy-induced dispersion is used (i.e., IOPT(4) is set to "1"). For distances less than the distance to final rise, the gradual plume rise is used to determine the buoyancy-induced dispersion regardless of the setting of IOPT(3).
- o Terrain adjustment factors are set to "0" for all stabilities.
- o Stack tip downwash (Briggs, 1974) is considered (i.e., IOPT(2) is set to "0").
- o Default urban or rural wind profile exponents are used depending on the value of MUOR; appropriate mixing heights are set.
- o Calms are treated according to methods developed by the EPA (1984) as discussed below.
- o Decay half-life is set to 4.0 hours for SO_2 for the urban option, and infinite half-life (no decay) for all other cases.

It is possible to operate in either the urban or rural mode when the default option is selected.

Table 7A contains a list of the subsequent settings for other options and the values for specific variables that will result when the default option is selected.

One result of exercising the default option is that calm conditions are handled according to methods developed by the EP: (1984). A calm hour can be identified in the model as an hour with a wind speed of 1.0 m/sec and a wind direction equal to the previous hour. When a calm is detected in the meteorological data, the concentrations at all receptors are set to zero, and the number of hours being averaged is reduced by one, except that the divisor used in calculating the average is never less than 75 percent of the averaging time. For any simulation, this results in the following:

- o 3-hour averages are determined by always dividing the sum of the hourly contributions by 3;
- o 8-hour averages are calculated by dividing the sum of the hourly contributions by the number of non-calm hours or 6, whichever is greater;
- o 24-hour averages are determined by dividing the sum of the hourly contributions by the number of non-calm hours or 18, whichever is greater; and
- o period of record averages, regardless of length, are calculated by dividing the sum of all the hourly contributions by the number of non-calm hours during the period of record.

Concentration calculations which are affected by calms are flagged in the printed output with the letter C placed next to the concentration value. Note that this treatment of calm cases is always used when the default option is selected, but cannot be used if the default option is not selected.

This calms procedure is not available in MPTR outside of the default option. The user can employ this procedure, however, through the use of the CALMPRO postprocessor program (EPA, 1984). CALMPRO is available as part of UNAMAP Version 6.

6.2.3.2 Input Options --

For the four following input options, specific action is taken if the value of 1 is entered.

6.2.3.2.1 Option 5: Met. Data on Cards -- If IOPT(5) = 1, met data are entered on cards with one card for each simulated hour (see 6.2.2.3 above). If Option 5 is 0, meteorological data is entered using records on unit 11. The specification of the records on this input file are given in the next section.

When the default option (IOPT (25)=1) is employed, IOPT (5) is set equal to 0, thus restricting the use of this option. This is done to avoid conflict with the calms processing procedure. If on-site or other than RAMMET data are to be used, they must correspond to the format of the RAMMET file and be read into the model on device (11).

6.2.3.2.2 Option 6: Read Hourly Emissions -- If IOPT(6) = 1, hourly emissions for each point source are read from unit 15 in the main program, then are compared with the emissions input on the point source card for scaling the exit velocity (see 6.2.2.1). Subroutine PTR performs these tasks; Section 7 specifies that records on this input file.

6.2.3.2.3 Option 7: Specify Significant Sources -- The number of significant sources, given as NSIGP on Card 4, is ranked when the emissions data are processed according to expected ground-level impact under B stability, with a wind at stack top of 3 m s^{-1} . This option can be employed if the contribution of a source is sought for a subsequent run that is outside this list or too far down it to be included among the significant sources, NSIGP on Card 4 (see 6.2.1.5 above). When IOPT(7) = 1, an additional input card is read (CARD TYPE 9) that indicates how many sources will be specified (NPT), then gives their source numbers (the array MPS) corresponding to the source numbers in the printed output list. Source numbers are assigned according to the order of the source input. For example, consider an application having 30 sources, where a run is deemed useful that shows contributions from 10 sources (NSIGP on CARD 4 will be set to 10). Specifically, the contributions from sources 7 and 22 are desired. The 12 most significant of the 25 sources, in order, are: 3, 8, 23, 11, 2, 15, 4, 27, 1, 5, 28, and 14. Since 7 and 22 are not among these 12, and further are not

in the first 10, Option 7 is set equal to 1, and CARD TYPE 9 contains 2 for NPT and the two numbers 7 and 22 for the two entries to MPS. Sources 7 and 22 will occupy the first two columns in the contribution table. The program will fill the other eight positions of the significant source list (to total 10) with the first eight sources of the list of 25, i.e., 3, 8, 23, 11, 2, 15, 4 and 27.

When the default option (IODT(25)=1) is employed, IOPT (7) is set equal to 0, thus restricting the use of this option. This is done to avoid confusion between estimates of zero concentration and hours with missing data since flags are not used other than in the high-5 tables to identify concentrations calculated for periods of calm winds.

6.2.3.2.4 Option 8: Input Radial Distances and Generate Polar Coordinate Receptors -- For the user's convenience in making computations at an array of receptors that are positioned about a specific source or some other point, Option 8 provides for reading an additional input card (CARD TYPE 10) with from one to five non-zero distances in user units. Additionally, the east and north coordinates (also in user units) of a center position are provided. The program generates the east and north coordinates of each receptor in a polar coordinate array, generating 36 receptors for each non-zero distance (one for each 10 degrees of azimuth). A five-value distance array is read from the card with distances entered for the number of distances desired. Zeros are added to fill the array. For example, to produce a receptor array with two distances, two distances and three zeros are entered. This step will generate 72 receptors (36 for each distance). Putting non-zero values for all five distances will generate 180 receptors, which is the maximum number that MPTER can compute. Thus using Option 8 in this manner will not allow the input of any additional receptor cards with positions specified by the user.

Of note to the user is that if both Option 8 and Option 1 for terrain adjustment are used, elevations of the polar coordinate receptors must be read in using CARD TYPE 11. These can best be obtained by drawing 36 radials from the designated center point on a topographical map, and drawing circles for each distance. Then the elevations can be determined from the map by reading elevations outward from the center, starting with the 10-degree azimuth radial. If all five distances are used so that 180 receptors are generated, a card with ENDREC in Columns 1-6 must be read following CARD TYPE 10 (or the last card of CARD TYPE 11 if used).

TABLE 6. MPTR CARD 4 - CONTROL AND CONSTANTS (1 card)

Variable	Description	Units
IDATE(1)	2 digit year (see 6.2.1.4)	-
IDATE(2)	starting Julian day for this run	-
IHSTR	starting hour for this run	-
NPER	number of averaging periods to be run (see 6.2.1.2)	-
NAVG	number of hours in an averaging period	-
IPOL	pollutant indicator: (see 6.2.1.3) 3 = SO ₂ 4 = suspended particulates	-
MUOR	urban/rural mode indicator: (see 6.2.1.10) 1 = urban 2 = rural	-
NSIGP	number of significant point sources, max = 25. (see 6.2.1.5)	-
NAV5	number of hours in the user specified period for which a high-five concentration table is generated. (see 6.2.1.3)	-
CONONE	multiplier constant, user units to km (see 6.2.1.5)	-
CELM	multiplier constant, user height units to m (see 6.2.1.6)	-
HAFL	pollutant half-life (see 6.2.1.7)	sec

All input variables are free format.

TABLE 7. MPTER CARD 5 - OPTIONS (1 card) - integer values: 0 or 1

Variable	Format	Description
<u>TECHNICAL OPTIONS (see 6.2.3.1)</u>		
IOPT(1)	Free	Use Terrain Adjustments
IOPT(2)	Format	No Stack Downwash
IOPT(3)		No Gradual Plume Rise
IOPT(4)		Include Buoyancy-Induced Dispersion
<u>INPUT OPTIONS (see 6.2.3.2)</u>		
IOPT(5)		Met. Data on Cards
IOPT(6)		Read Hourly Emissions
IOPT(7)		Specify Significant Sources
IOPT(8)		Input Radial Distances and Generate Polar Coordinate Receptors
<u>PRINTED OUTPUT OPTIONS (see 6.2.3.3)</u>		
IOPT(9)		Delete Emissions With Height Table
IOPT(10)		Delete Resultant Met. Data Summary for Averaging Period
IOPT(11)		Delete Hourly Contributions
IOPT(12)		Delete Met. Data on Hourly Contributions
IOPT(13)		Delete Final Plume Height and Distance to Final Rise on Hourly Contributions
IOPT(14)		Delete Hourly Summary
IOPT(15)		Delete Met. Data on Hourly Summary
IOPT(16)		Delete Final Plume Height and Distance to Final Rise on Hourly Summary
IOPT(17)		Delete Averaging-Period Contributions
IOPT(18)		Delete Averaging-Period Summary
IOPT(19)		Delete Average Concentrations and High-Five Table
<u>OTHER CONTROL AND OUTPUT OPTIONS (see 6.2.3.4)</u>		
IOPT(20)		Run is Part of a Segmented Run
IOPT(21)		Write Partial Concentrations to Disk or Tape
IOPT(22)		Write Hourly Concentrations to Disk or Tape
IOPT(23)		Write Averaging-Period Concentrations to Disk or Tape
IOPT(24)		Punch Averaging-Period Concentrations on Cards
IOPT(25)		Set Default Values (used for regulatory applications)

TABLE 7A DEFAULT OPTION - SUBSEQUENT SETTINGS

Employment of the default option (IODT (25)=1) will cause the input option switches and specified variables to be set to the following:

IOPT (2) = 0
IOPT (3) = 1
IOPT (4) = 1
IOPT (5) = 0
IOPT (7) = 0
IOPT (10) = 1
IOPT (11) = 1
IOPT (12) = 1
IOPT (13) = 1
IOPT (14) = 1
IOPT (15) = 1
IOPT (16) = 1
IOPT (17) = 1
IOPT (18) = 1
IOPT (19) = 0
IOPT (20) = 0
IOPT (21) = 0
IOPT (22) = 0
IOPT (23) = 0
IOPT (24) = 0

HAFL = 14400. (For IPOL = 3, MUOR = 1)
HAFL = 0. (For IPOL $\neq$ 3 or MUOR $\neq$ 1)
IHSTRT = 1
NAVG = 24
NSIGP = 0
NAV5 = 0
PL = .15,.15,.20,.25,.30,.30 for MUOR = 1
 = .07,.07,.10,.15,.35,.55 for MUOR = 2
CONTER = .0,.0,.0,.0,.0,.0

TABLE 23. MPTER OPTIONAL TEMPORARY FILE - VALUES FOR HIGH-FIVE TABLES
(unit 14) (output if option 20 = 1)

Variable	Dimensions	Description	Units
ONLY RECORD			
IDAY (on write)		Number of days processed	-
IDAYS (on read)		Number of days previously processed	-
SUM	180	Cumulation of long-term concentration	g/m^3
NHR		Number of hours processed	-
DAY1A		Starting Julian day of period of record	-
HR1		Starting hour of period of record	-
HMAXA	5,180,5	Concentrations according to rank, receptor, and averaging period	g/m^3
NDAY	5,180,5	Associated Julian day of concentration	-
IHR	5,180,5	Ending hour of concentration	-

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APPENDIX B
PLUME RISE FOR POINT SOURCES

The use of the methods of Briggs to estimate plume rise and effective height of emission are discussed below.

First, actual or estimated wind speed at stack top, $u(h)$, is assumed to be available.

Stack Downwash

To consider stack downwash, the physical stack height is modified following Briggs (1974, p. 4). The h' is found from

$$\begin{aligned} h' &= h + 2[(v_s/u(h)) - 1.5]d \quad \text{for } v_s < 1.5u(h), \\ h' &= h \quad \text{for } v_s \geq 1.5u(h), \end{aligned} \quad (B1)$$

where h is physical stack height (meters), v_s is stack gas velocity (meters per second), and d is inside stack-top diameter (meters). This h' is used throughout the remainder of the plume height computation. If stack downwash is not considered, $h' = h$ in the following equations.

Buoyancy Flux

For most plume rise situations, the value of the Briggs buoyancy flux parameter, F (m^3/s^3) is needed. The following equation is equivalent to Briggs' (1975, p. 63) Eq. 12:

$$F = (gv_s d^2 \Delta T) / (4T_s), \quad (B2)$$

where $\Delta T = T_s - T$, T_s is stack gas temperature (Kelvin), and T is ambient air temperature (Kelvin).

Unstable or Neutral: Momentum Rise

Regardless of the atmospheric stability, neutral-unstable momentum rise is calculated. The plume height is calculated from Briggs' (1969, p. 59) Eq. 5.2:

$$H = h' + 3dv_s/u(h). \quad (B3)$$

Briggs (1969) suggests that this equation is most applicable when v_s/u is greater than 4. Since momentum rise occurs quite close to the point of release, the distance to final rise is set equal to zero.

Unstable or Neutral: Buoyancy Rise

For situations where $T_s \geq T$, plume rise due to buoyancy is calculated. The distance to final rise x_f (in kilometers) is determined from the equivalent of Briggs' (1971, p. 1031) Eq. 7, and the distance to final rise is assumed to be $3.5x^*$, where x^* is the distance at which atmospheric turbulence begins to dominate entrainment. For F less than 55,

$$x_f = 0.049F^{5/8}. \quad (B4)$$

For F equal to or greater than 55,

$$x_f = 0.119F^{2/5}. \quad (B5)$$

The plume height, H (in meters), is determined from the equivalent of the combination of Briggs' (1971, p. 1031) Eqs. 6 and 7. For F less than 55,

$$H = h' + 21.425F^{3/4}/u(h). \quad (B6)$$

For F equal to or greater than 55,

$$H = h' + 38.71F^{3/5}/u(h). \quad (B7)$$

If the unstable-neutral momentum rise (previously calculated from Eq. B3) is higher than the unstable-neutral buoyancy rise calculated here, momentum rise applies. Since momentum rise takes place near the stack top, the distance to final rise is set equal to zero.

Stability Parameter

For stable situations, the stability parameter s is calculated from the equation (Briggs, 1971, p. 1031):

$$s = g(\partial\theta/\partial z)/T. \quad (B8)$$

As an approximation, for stability class E (or 5), $\partial\theta/\partial z$ is taken as 0.02 K/m, and for stability class F (or 6), $\partial\theta/\partial z$ is taken as 0.035 K/m.

Stable: Momentum Rise

When the stack gas temperature is less than the ambient air temperature, it is assumed that the plume rise is dominated by momentum. A plume height is calculated from Briggs' (1969, p. 59) Eq. 4.28:

$$H = h' + 1.5\{(\bar{v}_s^2 d^2 T)/[4T_s u(h)]\}^{1/3} s^{-1/6}. \quad (B9)$$

This is compared with the value for unstable-neutral momentum rise (Eq. B3) and the lower of the two values is used as the resulting momentum plume height.

Stable: Buoyancy Rise

For situations where $T_s \geq T$, the plume rise due to buoyancy is calculated. The distance to final rise (in kilometers) is determined by the equivalent of a combination of Briggs' (1975, p. 96) Eqs. 48 and 59:

$$x_f = 0.0020715u(h)s^{-1/2}. \quad (B10)$$

The plume height is determined by the equivalent of Briggs' (1975, p. 96) Eq. 59:

$$H = h' + 2.6\{F/[u(h)s]\}^{1/3}. \quad (B11)$$

If the stable momentum rise is higher than the stable buoyancy rise calculated here, momentum rise applies and the distance to final rise is set equal to zero.

All Conditions: Distance Less than Distance to Final Rise (Gradual Rise)

Where gradual rise is to be estimated for unstable, neutral or stable conditions, if the distance upwind from receptor to source x (in kilometers) is less than the distance to final rise, the equivalent of Briggs' (1971, p. 1030) Eq. 2 is used to determine plume height:

$$H = h' + (160F^{1/3}x^{2/3})/u(h). \quad (B12)$$

This height is used only for buoyancy-dominated conditions; should it exceed the final rise for the appropriate condition, the final rise is substituted instead.

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APPENDIX B

LISTING OF FORTRAN SOURCE CODE

The source code of MPTER (Version 85165) follows. The program consists of a main module , five subroutines, and one function. These pages replace Appendix C of the original document.

THERE ARE IN ADDITION SEVERAL FEATURES THAT ARE INHERENT IN THE UNAMAP 5 AND LATER VERSIONS OF MPTER. THESE ARE:

- MOMENTUM PLUME RISE IS ALWAYS ACCOUNTED FOR.
- TERRAIN ADJUSTMENTS ARE USED FOR RECEPTORS BELOW STACK BASE ELEVATION IN THE SAME MANNER AS ELEVATED RECEPTORS
- MIXING HEIGHT IS COMPARED WITH FINAL PLUME HEIGHT WITHOUT REGARD TO PLUME HEIGHT CHANGES DUE TO TERRAIN.

TWO SYSTEMS OF LENGTH AND COORDINATES ARE USED IN MPTR:

THE FIRST SYSTEM, USER UNITS, IS SELECTED BY THE USER AND NORMALLY USES THE COORDINATE SYSTEM OF THE EMISSION INVENTORY. ALL LOCATIONS INPUT BY THE USER (SUCH AS SOURCES AND RECEPTORS ARE IN THIS SYSTEM. ALSO AS A CONVENIENCE TO THE USER, ALL LOCATIONS ON OUTPUT ARE ALSO IN THIS SYSTEM.

THE SECOND SYSTEM, X, Y, IS AN UPWIND, CROSSWIND COORDINATE SYSTEM RELATIVE TO EACH RECEPTOR. THE X-AXIS IS DIRECTED UPWIND (SAME AS WIND DIRECTION FOR THE HOUR). IN ORDER TO DETERMINE DISPERSION PARAMETER VALUES AND EVALUATE EQUATIONS FOR CONCENTRATION ESTIMATES, DISTANCES IN THIS SYSTEM MUST BE IN KILOMETERS. THIS SYSTEM IS INTERNAL AND IS NOT APPARENT TO THE USER.

C->->->-> SECTION B - DATA INPUT LISTS.

C*** CARD VARIABLES AND FORMAT.

THE REQUIRED AND OPTIONAL CARD TYPES USED AS INPUT TO

** MPT00710
 ** MPT00720
 ** MPT00730
 ** MPT00740
 ** MPT00750
 ** MPT00760
 ** MPT00770
 ** MPT00780
 ** MPT00790
 ** MPT00800
 ** MPT00810
 ** MPT00820
 ** MPT00830
 ** MPT00840
 ** MPT00850
 ** MPT00860
 ** MPT00870
 ** MPT00880
 ** MPT00890
 ** MPT00900
 ** MPT00910
 ** MPT00920
 ** MPT00930
 ** MPT00940
 ** MPT00950
 ** MPT00960
 ** MPT00970
 ** MPT00980
 ** MPT00990
 ** MPT01000
 ** MPT01010
 ** MPT01020
 ** MPT01030
 ** MPT01040
 ** MPT01050
 ** MPT01060
 ** MPT01070
 ** MPT01080
 ** MPT01090
 ** MPT01100
 ** MPT01110
 ** MPT01120
 ** MPT01130
 ** MPT01140
 ** MPT01150
 ** MPT01160
 ** MPT01170
 ** MPT01180
 ** MPT01190
 ** MPT01200
 AND MPT01210
 RY. MPT01220
 (ORS) MPT01230
 MPT01240
 MPT01250
 MPT01260
 MPT01270
 MPT01280
 MPT01290
 MPT01300
 MPT01310
 S MPT01320
 MPT01330
 MPT01340
 MPT01350
 MPT01360
 MPT01370
 MPT01380
 MPT01390
 MPT01400

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C*** CARDS 1 - 3 ALPHANUMERIC DATA FOR TITLES. FORMAT(20A4)
C
C LINE1 - 80 ALPHANUMERIC CHARACTERS.
C LINE2 - 80 ALPHANUMERIC CHARACTERS.
C LINE3 - 80 ALPHANUMERIC CHARACTERS.
C*** CARD 4 CONTROL AND CONSTANTS. FORMAT(FREE)
C
C IDATE(1) - 2-DIGIT YEAR FOR THIS RUN.
C IDATE(2) - STARTING JULIAN DAY FOR THIS RUN.
C IHSTRT - STARTING HOUR FOR THIS RUN.
C NPER - NUMBER OF AVERAGING PERIODS TO BE RUN.
C NAVG - NUMBER OF HOURS IN AN AVERAGING PERIOD.
C IPOL - POLLUTANT INDICATOR; IS 3 FOR SO2, 4 FOR SUSPENDED
C PARTICULATE.
C MUOR - MODEL INDICATOR: 1 FOR URBAN, 2 FOR RURAL.
C NSIGP - NUMBER OF SOURCES FROM WHICH CONC. CONTRIBUTIONS
C ARE DESIRED (MAX = 25).
C NAV5 - ADDITIONAL AVERAGING TIME FOR HIGH-FIVE TABLE;
C MOST LIKELY EQUAL TO 2, 4, 6, OR 12.
C CONONE - MULTIPLIER TO CONVERT USER UNITS TO KILOMETERS.
C EXAMPLE MULTIPLIERS:
C FEET TO KM 3.048E-04
C MILES TO KM 1.609344
C METERS TO KM 1.0E-03
C CELM - MULTIPLIER TO CONVERT USER HEIGHT UNITS TO METERS.
C EXAMPLE MULTIPLIER:
C FEET TO METERS 0.3048
C HAFL - POLLUTANT HALF-LIFE, SECONDS. AN ENTRY OF ZERO WILL
C CAUSE SKIPPING OF POLLUTANT LOSS CALCULATIONS.
C
C *****
C * THE USER IS REFERRED TO THE USERS GUIDE FOR *
C * MORE DETAILED INFORMATION ON OPTIONS. ESPECIALLY *
C * IMPORTANT IS AN UNDERSTANDING OF PRINTED OUTPUT *
C * AND USE OF OPTIONS 9 THROUGH 19 TO DELETE UNNEEDED*
C * INFORMATION. MPTER IS CAPABLE OF GENERATING A *
C * LARGE QUANTITY OF PRINTED INFORMATION UNLESS SOME *
C * OF THESE OPTIONS TO DELETE OUTPUT ARE USED *
C * LIBERALLY. *
C *****
C*** CARD 5. OPTIONS. FORMAT(FREE)
C
C 1 = EMPLOY OPTION; 0 = DON'T USE OPTION.
C
C TECHNICAL OPTIONS:
C IOPT(1) - USE TERRAIN ADJUSTMENTS.
C IOPT(2) - NO STACK DOWNWASH.
C IOPT(3) - NO GRADUAL PLUME RISE.
C IOPT(4) - USE BUOYANCY INDUCED DISPERSION.
C
C INPUT OPTIONS:
C IOPT(5) - MET. DATA IS ON CARDS.
C IOPT(6) - READ HOURLY EMISSIONS.
C IOPT(7) - SPECIFY SIGNIFICANT SOURCES.
C IOPT(8) - INPUT RADIAL DISTANCES AND GENERATE POLAR
C COORDINATE RECEPTORS.
C
C PRINTED OUTPUT OPTIONS:
C IOPT(9) - DELETE EMISSIONS WITH HEIGHT TABLE.
C IOPT(10) - DELETE RESULTANT MET. DATA SUMMARY FOR AVG. PERIOD.
C IOPT(11) - DELETE HOURLY CONTRIBUTIONS.
C IOPT(12) - DELETE MET. DATA ON HOURLY CONTRIBUTIONS.
C IOPT(13) - DELETE FINAL PLUME HEIGHT AND DISTANCE TO FINAL
C RISE ON HOURLY CONTRIBUTIONS.
C IOPT(14) - DELETE HOURLY SUMMARY.
C IOPT(15) - DELETE MET. DATA ON HOURLY SUMMARY.
C IOPT(16) - DELETE FINAL PLUME HEIGHT AND DISTANCE TO FINAL
C RISE ON HOURLY SUMMARY.

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MPT01410
MPT01420
MPT01430
MPT01440
MPT01450
MPT01460
MPT01470
MPT01480
MPT01490
MPT01500
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MPT01520
MPT01530
MPT01540
MPT01550
MPT01560
MPT01570
MPT01580
MPT01590
MPT01600
MPT01610
MPT01620
MPT01630
MPT01640
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MPT01660
MPT01670
MPT01680
MPT01690
MPT01700
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MPT01960
MPT01970
MPT01980
MPT01990
MPT02000
MPT02010
MPT02020
MPT02030
MPT02040
MPT02050
MPT02060
MPT02070
MPT02080
MPT02090
MPT02100

C CENTX - EAST COORDINATE ABOUT WHICH RADIALS ARE CENTERED. MPT02810
 C CENY - NORTH COORDINATE ABOUT WHICH RADIALS ARE CENTERED. MPT02820
 C (USER UNITS) MPT02830
 C*** CARD TYPE 11. POLAR COORDINATE RECEPTOR ELEVATIONS. MPT02840
 C FORMAT(12,8X,5F10.0). (USED IF OPTIONS 1 AND 8 ARE BOTH 1) MPT02850
 C IDUM - AZIMUTH INDICATOR (1 TO 36) MPT02860
 C ELRDUM(I),I=1,5 - RECEPTOR ELEVATIONS FOR THIS AZIMUTH FOR MPT02870
 C UP TO FIVE DISTANCES (USER HEIGHT UNITS). MPT02880
 C MPT02890
 C*** CARD TYPE 12. RECEPTOR. FORMAT(2A4,2F10.3,2F10.0) MPT02900
 C (UP TO 180 RECEPTORS MAY BE GENERATED INCLUDING POLAR COORDINATE MPT02910
 C ONES IF OPTION 8 = 1.) MPT02920
 C RNAME(I),I=1,2 - 8 DIGIT ALPHANUMERIC STATION IDENTIFICATION. MPT02930
 C RREC - EAST COORDINATE OF RECEPTOR (USER UNITS) MPT02940
 C SREC - NORTH COORDINATE OF RECEPTOR (USER UNITS) MPT02950
 C ZR - RECEPTOR HEIGHT ABOVE LOCAL GROUND-LEVEL (METERS) MPT02960
 C ELR - RECEPTOR GROUND-LEVEL ELEVATION (USER HT UNITS) MPT02970
 C MPT02980
 C MPT02990
 C MPT03000
 C MPT03010
 C CARD WITH 'ENDR' IN COLS 1-4 IS USED TO SIGNIFY THE END OF
 C THE RECEPTOR CARDS. MPT03020
 C MPT03030
 C*** CARD TYPE 13. SEGMENTED RUN. FORMAT(FREE) MPT03040
 C (USED IF OPTION 20=1) MPT03050
 C IDAY - NUMBER OF DAYS PREVIOUSLY PROCESSED. MPT03060
 C LDRUN - LAST DAY TO BE PROCESSED IN THIS RUN. MPT03070
 C MPT03080
 C*** CARD TYPE 14. METEOROLOGY. FORMAT(FREE) MPT03090
 C (ONE CARD FOR EACH HOUR OF THE SIMULATION.) MPT03100
 C (USED IF OPTION 5 = 1) MPT03110
 C JYR - YEAR OF MET DATA. (2 DIGITS) MPT03120
 C DAY1 - JULIAN DAY OF MET DATA. MPT03130
 C JHR - HOUR OF MET DATA. MPT03140
 C IKST - STABILITY CLASS FOR THIS HOUR. MPT03150
 C QU - WIND SPEED FOR THIS HOUR (M/SEC). MPT03160
 C QTEMP - AMBIENT AIR TEMPERATURE FOR THIS HOUR (KELVIN). MPT03170
 C QTHETA - WIND DIRECTION FOR THIS HOUR (DEGREES AZIMUTH FROM MPT03180
 C WHICH THE WIND BLOWS). MPT03190
 C QHL - MIXING HEIGHT FOR THIS HOUR (METERS). MPT03200
 C MPT03210
 C MPT03220
 C MPT03230
 C MPT03240
 C MPT03250
 C MPT03260
 C MPT03270
 C MPT03280
 C MPT03290
 C MPT03300
 C MPT03310
 C MPT03320
 C MPT03330
 C MPT03340
 C MPT03350
 C MPT03360
 C MPT03370
 C MPT03380
 C MPT03390
 C MPT03400
 C MPT03410
 C MPT03420
 C MPT03430
 C MPT03440
 C MPT03450
 C MPT03460
 C MPT03470
 C MPT03480
 C MPT03490
 C MPT03500

C-->-->--> SECTION C - COMMON, DIMENSION, AND DATA STATEMENTS.

C /EXPOS/ BETWEEN MAIN PROGRAM AND BLOCK DATA
 C COMMON /EXPOS/ PXUCOF(6,9),PXUEXP(6,9),HCL(10),BXUCOF(6,9),BXUEXP(
 C *6,9)

C /MPOR/ BETWEEN MAIN, PTR, OUTHR, AND RCP
 C COMMON /MPOR/ IOPT(26)

C /MPO/ BETWEEN MAIN, PTR, AND OUTHR
 C COMMON /MPO/ NRECEP, NAVG, NB, LH, NPT, IDATE(2), RREC(180), SREC(180), ZRMPT03330
 C 1(180), ELR(180), PHCHI(180), PHSIGS(180,26), HSAV(250), DSAV(250), PCHI(MPT03340
 C 2180), PSIGS(180,26), IPOL

C /MPR/ BETWEEN MAIN, PTR, AND RCP
 C COMMON /MPR/ UPL,Z,H,HL,X,Y,KST,DELH,SY,SZ,RC,MUOR

C /MP/ BETWEEN MAIN PROGRAM AND PTR
 C COMMON /MP/ SOURCE(9,250), CONTWO, PSAV(250), IPSIGS(250), U, TEMP, SINTMPT03390
 C 1,COST,PL(6), ELP(250), ELHN,HANE,TLOS,CELM,CTER

C /MO/ BETWEEN MAIN PROGRAM AND OUTHR
 C COMMON /MO/ QTHETA(24), QU(24), IKST(24), QHL(24), QTEMP(24), MPS(25), NMPT03400
 C 1SIGP, IO, LINE1(20), LINE2(20), LINE3(20), RNAME(2,180), IRANK(180), STARMPT03410
 C 2(5,180)

C /MR/ BETWEEN MAIN PROGRAM AND RANK
 C COMMON /MR/ HMAXA(5,180,5), NDAY(5,180,5), IHR(5,180,5), CONC(180,5), MPT03420
 C 1JDAY,NR

C DIMENSION PNAME(3,250), IFREQ(7), DUMR(24), HLH(2,24), IMPS(25), TMPT03430
 C 1ITLE(2), TABLE(2,21), CONTER(6), RADIL(5), ANAME(36), PLL(6,2) MPT03440


```

C          *
C          !
C          EXIT
C-->-->-->SECTION E - RUN SET-UP AND READ FIRST 6 INPUT CARDS.
C
C      INITIALIZATIONS.....
C      THE FOLLOWING 18 STATEMENTS MAY BE DELETED FOR USE ON
C      COMPUTERS THAT ZERO CORE LOCATIONS USED BY A PROBLEM
C      PRIOR TO EXECUTION.
C      NRECEP=0
C      NP=0
C      NHR=0
C      NP3=0
C      NP8=0
C      NP24=0
C      NPX=0
C      DO 10 I=1,21
C      TABLE(1,I)=0.
10  TABLE(2,I)=0.
C      DO 40 I=1,180
C      SUM(I)=0.
C      DO 30 J=1,5
C      CONC(I,J)=0.
20  DO 20 K=1,5
30  HMAXA(J,I,K)=0.
40  CONTINUE
C      CONTINUE
C      I/O DEVICE INITIALIZATIONS
C      IN=5
C      IO=6
C      UNIT 11 - DISK INPUT OF MET DATA--USED WHEN IOPT(5)=1.
C      UNIT 10 - DISK OUPUT OF PARTIAL CONCENTRATIONS
C      AT EACH RECEPTOR--USED WHEN IOPT(21) = 1.
C      UNIT 12 TAPE/DISK OUTPUT OF HRLY CONCENTRATIONS-IF IOPT(22)=1.
C      UNIT 13 TAPE/DISK OUTPUT OF CONCENTRATIONS FOR AVERAGING PERIOD
C      USED IF IOPT(23) = 1.
C      UNIT 14 TAPE/DISK STORAGE FOR SUMMARY INFO, USED IF IOPT(20)=1.
C      UNIT 15 - TAPE/DISK INPUT OF HOURLY POINT SOURCE EMISSIONS
C      -- USED IF IOPT(6) = 1.
C
C      READ CARDS 1-3 (SEE DESCRIPTION, SECTION B).
C
C      READ (IN,1180) LINE1,LINE2,LINE3
C
C      READ CARD TYPE 4 (SEE DESCRIPTION, SECTION B).
C
C      READ (IN,*) IDATE(1),IDATE(2),IHSTRT,NPER,NAVG,IPOL,MUOR,NSIGP,
C      INAV5,CONONE,CELM,HAFL
C      THE ABOVE FORMAT IS UNIVACS FREE FIELD INPUT.
C      VARIABLES MUST BE SEPARATED BY COMMAS.
C      THIS IS SIMILAR TO IBM'S LIST DIRECTED IO.
C      WRITE (IO,1395)(MODEL(K,MUOR),K=1,2),LINE1,LINE2,LINE3
C      IF (NSIGP.LE.25) GO TO 50
C      WRITE (IO,1250) NSIGP
C      STOP
50  IP=IPOL-2
C      CONTWO=CONONE
C      READ CARD TYPE 5 (SEE DESCRIPTION, SECTION B).
C
C      READ (IN,*) (IOPT(I),I=1,25)
C
C      IF(IOPT(25).NE.1) GO TO 55
C
C      DEFAULT SELECTION RESULTS IN THE FOLLOWING: USE STACK DOWNWASH
C      (2); USE FINAL PLUME RISE (3); USE BUOYANCY-INDUCED DISPERSION
C      (4); WRITE HIGH-5 TABLES (19) BUT DELETE ALL OTHER OUTPUT (10,
C      11,12, 13, 14, 15, 16, 17, 18, 21, 22, 23, AND 24).
C
C      IOPT(2)=0

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MPT04210
MPT04220
MPT04230
MPT04240
MPT04250
MPT04260
MPT04270
MPT04280
MPT04290
MPT04300
MPT04310
MPT04320
MPT04330
MPT04340
MPT04350
MPT04360
MPT04370
MPT04380
MPT04390
MPT04400
MPT04410
MPT04420
MPT04430
MPT04440
MPT04450
MPT04460
MPT04470
MPT04480
MPT04490
MPT04500
MPT04510
MPT04520
MPT04530
MPT04540
MPT04550
MPT04560
MPT04570
MPT04580
MPT04590
MPT04600
MPT04610
MPT04620
MPT04630
MPT04640
MPT04650
MPT04660
MPT04670
MPT04680
MPT04690
MPT04700
MPT04710
MPT04720
MPT04730
MPT04740
MPT04750
MPT04760
MPT04770
MPT04780
MPT04790
MPT04800
MPT04810
MPT04820
MPT04830
MPT04840
MPT04850
MPT04860
MPT04870
MPT04880
MPT04890
MPT04900

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	IOPT(3)=1	MPT04910
	IOPT(4)=1	MPT04920
	IOPT(5)=0	MPT04930
	IOPT(7)=0	MPT04940
	IOPT(10)=1	MPT04950
	IOPT(11)=1	MPT04960
	IOPT(12)=1	MPT04970
	IOPT(13)=1	MPT04980
	IOPT(14)=1	MPT04990
	IOPT(15)=1	MPT05000
	IOPT(16)=1	MPT05010
	IOPT(17)=1	MPT05020
	IOPT(18)=1	MPT05030
	IOPT(19)=0	MPT05040
	IOPT(20)=0	MPT05050
	IOPT(21)=0	MPT05060
	IOPT(22)=0	MPT05070
	IOPT(23)=0	MPT05080
	IOPT(24)=0	MPT05090
C		MPT05100
C	SET HALF-LIFE FOR DEFAULT OPTION	MPT05110
	IF(IPOL.EQ.3.AND.MUOR.EQ.1)HAFL=14400.	MPT05120
	IF(IPOL.NE.3.OR.MUOR.NE.1)HAFL=0.	MPT05130
C		MPT05140
C	SET START HOUR AND AVERAGING PERIOD;	MPT05150
C	SET THE NUMBER OF SIGNIFICANT POINT AND	MPT05160
C	AREA SOURCES.	MPT05170
	IHSTRT=1	MPT05180
	NAVG=24	MPT05190
	NSIGP=0	MPT05200
C		MPT05210
55	CONTINUE	MPT05220
C		MPT05230
C	WRITE GENERAL INPUT INFORMATION	MPT05240
	WRITE (IO,1410) TITLE(IP),NPER,NAVG,IHSTRT,IDATE(2),IDATE(1),CONTW	MPT05250
	IO,NSIGP	MPT05260
	DAYIA=IDATE(2)	MPT05270
	HR1=IHSTRT	MPT05280
	IF (HAFL.GT.0.0) GO TO 60	MPT05290
	TLOS=0.	MPT05300
	WRITE (IO,1420)	MPT05310
	GO TO 70	MPT05320
60	WRITE (IO,1430) HAFL	MPT05330
	TLOS=693./HAFL	MPT05340
70	IF (IOPT(19).EQ.1) GO TO 80	MPT05350
	NAVT=5	MPT05360
C	FOR DEFAULT OPTION	MPT05370
C	ADDITIONAL AVERAGING PERIOD SET TO ZERO.	MPT05380
	IF(IOPT(25).EQ.1) NAV5=0	MPT05390
	IF (NAV5.EQ.1.OR.NAV5.EQ.3.OR.NAV5.EQ.8.OR.NAV5.EQ.24.OR.NAV5.EQ.0	MPT05400
	1) NAVT=4	MPT05410
	NTIME(5)=NAVT	MPT05420
	ATIME(5)=NAVT	MPT05430
	WRITE (IO,1440) NAVT	MPT05440
80	IF (IOPT(1).EQ.0) GO TO 90	MPT05450
	WRITE (IO,1450) CELM	MPT05460
	ELHN=99999.	MPT05470
	ELOW=99999.	MPT05480
90	IF (NSIGP.GT.0) GO TO 100	MPT05490
	IOPT(11)=1	MPT05500
	IOPT(17)=1	MPT05510
100	WRITE (IO,1460) (I,IOPT(I),I=1,13)	MPT05520
	WRITE (IO,1470) (I,IOPT(I),I=14,25)	MPT05530
C		MPT05540
C	READ CARD TYPE 6 (SEE DESCRIPTION, SECTION B).	MPT05550
C		MPT05560
C	SWITCH TO SELECT DEFAULT POWER LAW EXPONENTS,	MPT05570
C	TERRAIN ADJUSTMENT FACTORS.	MPT05580
		MPT05590
		MPT05600

C	IF(IOPT(25).NE.0)READ(IN,*)HANE	MPT05610
	IF(IOPT(25).EQ.0)READ(IN,*)HANE,PL,CONTER	MPT05620
	IF(IOPT(25).EQ.0)GO TO 105	MPT05630
	DO 104 I1=1,6	MPT05640
	PL(I1)=PLL(I1,MUOR)	MPT05650
104	CONTINUE	MPT05660
105	CONTINUE	MPT05670
C		MPT05680
	IF (IOPT(1).EQ.1) GO TO 110	MPT05690
	WRITE (IO,1480) HANE,PL	MPT05700
	GO TO 140	MPT05710
110	WRITE (IO,1490) HANE,PL,CONTER	MPT05720
	DO 120 I=1,6	MPT05730
	IF (CONTER(I).LT.0..OR.CONTER(I).GT.1.) GO TO 130	MPT05740
120	CONTINUE	MPT05750
	GO TO 140	MPT05760
130	WRITE (IO,1260)	MPT05770
	STOP	MPT05780
C		MPT05790
C		MPT05800
C	MUCH OF THE FOLLOWING PROGRAM SECTION IS BASED UPON	MPT05810
C	RAMQ IN THE RAM SYSTEM. THIS SECTION IS RESPONSIBLE	MPT05820
C	FOR MAKING THE NECESSARY DATA CONVERSIONS ON THE RAW	MPT05830
C	EMISSIONS DATA IN ORDER TO ESTABLISH A STANDARD	MPT05840
C	DATA BANK WHICH WILL BE ACCEPTABLE. A CONVERSION FACTOR	MPT05850
C	FROM USER UNITS TO KILOMETERS IS APPLIED WHEN NECESSARY.	MPT05860
C-->-->-->	SECTION F - INPUT AND PROCESS EMISSION INFORMATION.	MPT05870
C		MPT05880
140	WRITE (IO,1500)	MPT05890
	NPT=0	MPT05900
C	BEGIN LOOP TO READ THE POINT SOURCE INFORMATION	MPT05910
150	NPT=NPT+1	MPT05920
	IF (NPT.LE.MAXP) GO TO 160	MPT05930
	READ (IN,1200) DUM	MPT05940
	IF (DUM.EQ.ENDP) GO TO 230	MPT05950
	WRITE (IO,1270) MAXP	MPT05960
	STOP	MPT05970
C		MPT05980
C		MPT05990
C	READ CARD TYPE 7 (SEE DESCRIPTION, SECTION B).	MPT06000
160	READ (IN,1210) (PNAME(I,NPT),I=1,3),(SOURCE(I,NPT),I=1,8),ELP(NPT)	MPT06010
C	CARD WITH 'ENDP' IN COL 1-10 IS USED TO SIGNIFY END OF	MPT06020
C	POINT SOURCES.	MPT06030
	IF (PNAME(1,NPT).EQ.ENDP) GO TO 230	MPT06040
C	ELHN, ELEVATION OF LOWEST STACK TOP IN INVENTORY, IS DETERMINED	MPT06050
C	IN USER HEIGHT UNITS	MPT06060
	IF (IOPT(1).EQ.0) GO TO 170	MPT06070
	TOM=SOURCE(5,NPT)/CELM+ELP(NPT)	MPT06080
	IF (TOM.LT.ELHN) ELHN=TOM	MPT06090
C	LOWPT, ELEVATION OF LOWEST SOURCE GROUND-LEVEL	MPT06100
C	IN INVENTORY, IN USER HEIGHT UNITS.	MPT06110
	IF (ELP(NPT).LT.ELOW) ELOW=ELP(NPT)	MPT06120
C	CALCULATE BUOYANCY FACTOR	MPT06130
170	D=SOURCE(7,NPT)	MPT06140
C	FOLLOWING VARIABLE IS BRIGGS' F WITHOUT TEMPERATURE FACTOR.	MPT06150
	SOURCE(9,NPT)=2.45153*SOURCE(8,NPT)*D*D	MPT06160
C	2.45153 IS GRAVITY OVER FOUR.	MPT06170
	TS=SOURCE(6,NPT)	MPT06180
	IF (TS.GT.293.) GO TO 180	MPT06190
	HF=SOURCE(5,NPT)	MPT06200
	GO TO 200	MPT06210
180	F=SOURCE(9,NPT)*(TS-293.)/TS	MPT06220
	IF (F.GE.55.) GO TO 190	MPT06230
C	ONLY BUOYANCY PLUME RISE IS CONSIDERED HERE.	MPT06240
	HF=SOURCE(5,NPT)+21.425*F**0.75/3.	MPT06250
	GO TO 200	MPT06260
190	HF=SOURCE(5,NPT)+38.71*F**0.6/3.	MPT06270
C	HSAV, DSAV, AND PSAV ARE USED FOR TEMPORARY STORAGE	MPT06280
C	(OR AS DUMMIES) FOR THE NEXT 60 STATEMENTS.	MPT06290
		MPT06300

200	HSAB(NPT)=HF	MPT06310
C	DETERMINE HEIGHT INDEX.	MPT06320
	DO 210 IH=2,9	MPT06330
210	IF (HF.LT.(HC1(IH)-.01)) GO TO 220	MPT06340
	CONTINUE	MPT06350
	IH=10	MPT06360
220	IS=IH-1	MPT06370
	IF(MUOR.EQ.1)GO TO 221	MPT06380
	A=PXUCOF(2,IS)	MPT06390
	B=PXUEXP(2,IS)	MPT06400
	GO TO 222	MPT06410
221	A=BXUCOF(2,IS)	MPT06420
	B=BXUEXP(2,IS)	MPT06430
222	DSAB(NPT)=(A*HF**B)*SOURCE(IPOL,NPT)/3.	MPT06440
C	AN ESTIMATE OF THE POTENTIAL IMPACT OF EACH SOURCE IS	MPT06450
C	DETERMINED AND STORED IN DSAB. MAX CONCENTRATION IS	MPT06460
C	DETERMINED BY CHI(MAX)=(A*H**B)*Q/U WHERE	MPT06470
C	A IS THE COEFFICIENT AND B IS THE EXPONENT, OF	MPT06480
C	MAXIMUM CHI*U/Q VALUES PREDETERMINED FOR B STABILITY	MPT06490
C	AND A SPECIFIC EFFECTIVE HEIGHT RANGE. PLUME RISE	MPT06500
C	IS CALCULATED FOR B STABILITY AND 3 M/SEC WIND SPEED.	MPT06510
C	GO BACK AND READ DATA FOR ANOTHER POINT SOURCE.	MPT06520
	IPSIGS(NPT)=0	MPT06530
C	LIST POINT SOURCE INFORMATION.	MPT06540
	WRITE (IO,1510) NPT,(PNAME(J,NPT),J=1,3),(SOURCE(K,NPT),K=1,8),DSAB(NPT),HSAB(NPT),ELP(NPT),F	MPT06550
	GO TO 150	MPT06560
230	NPT=NPT-1	MPT06570
C	CHECK FOR NPT < OR = 0	MPT06580
	IF (NPT.GT.0) GO TO 240	MPT06590
	WRITE (IO,1280) NPT	MPT06600
	STOP	MPT06610
C		MPT06620
C-->-->-->SECTION G - RANK SIGNIFICANT SOURCES.		MPT06630
C		MPT06640
240	IF (NSIGP.EQ.0) GO TO 280	MPT06650
C	RANK NSIGP HIGHEST POINT SOURCES.	MPT06660
	IF (NPT.LT.NSIGP) NSIGP=NPT	MPT06670
	DO 260 I=1,NSIGP	MPT06680
	SIGMAX=-1.0	MPT06690
	DO 250 J=1,NPT	MPT06700
	IF (DSAB(J).LE.SIGMAX) GO TO 250	MPT06710
	SIGMAX=DSAB(J)	MPT06720
	IMAX=J	MPT06730
250	CONTINUE	MPT06740
C	IMPS IS THE SOURCE NUMBER IN ORDER OF SIGNIFICANCE.	MPT06750
	IMPS(I)=IMAX	MPT06760
C	PSAB IS THE CALC. CONC. IN ORDER OF SIGNIFICANCE.	MPT06770
	PSAB(I)=SIGMAX	MPT06780
260	DSAB(IMAX)=-1.0	MPT06790
C	OUTPUT TABLE OF RANKED SOURCES.	MPT06800
	WRITE (IO,1520) TITLE(IP)	MPT06810
	DO 270 I=1,NSIGP	MPT06820
	WRITE (IO,1530) I,PSAB(I),IMPS(I)	MPT06830
270	CONTINUE	MPT06840
C		MPT06850
C-->-->-->SECTION H - EMISSIONS WITH HEIGHT TABLE.		MPT06860
C		MPT06870
280	IF (IOPT(9).EQ.1) GO TO 340	MPT06880
	DO 320 I=1,NPT	MPT06890
	DO 290 J=1,20	MPT06900
	HC=J*5.	MPT06910
	IF (SOURCE(5,I).LE.HC) GO TO 300	MPT06920
290	CONTINUE	MPT06930
C	POINT SOURCES WITH PHYSICAL HEIGHTS GT 100 METERS ARE LISTED	MPT06940
C	SEPARATELY.	MPT06950
	WRITE (IO,1540) I,SOURCE(5,I),SOURCE(IPOL,I)	MPT06960
	GO TO 310	MPT06970
C	ADD EMISSION RATE INTO TABLE AND TOTAL.	MPT06980
		MPT06990
		MPT07000

300	TABLE(1,J)=TABLE(1,J)+SOURCE(IPOL,I)	MPT07010
310	TABLE(1,21)=TABLE(1,21)+SOURCE(IPOL,I)	MPT07020
320	CONTINUE	MPT07030
C	OUTPUT SOURCE-STRENGTH-HEIGHT TABLE	MPT07040
C	THIS TABLE DISPLAYS THE TOTAL EMISSIONS FOR POINT	MPT07050
C	SOURCES AND THE CUMULATIVE FREQUENCY ACCORDING TO	MPT07060
C	HEIGHT CLASS	MPT07070
C	WRITE (IO,1550) TITLE(IP)	MPT07080
C	HEIGHT CLASS EMISSIONS ARE IN 1	MPT07090
C	DETERMINE CUMULATIVE PERCENT IN 2	MPT07100
	IH1=0	MPT07110
	IH2=5	MPT07120
	IM1=1	MPT07130
	TABLE(2,1)=TABLE(1,1)/TABLE(1,21)	MPT07140
	WRITE (IO,1560) IH1,IH2,(TABLE(J,1),J=1,2)	MPT07150
	DO 330 I=2,20	MPT07160
	IH2=I*5	MPT07170
	IH1=IH2-4	MPT07180
	IM1=I-1	MPT07190
	TABLE(2,I)=TABLE(1,I)/TABLE(1,21)+TABLE(2,IM1)	MPT07200
	WRITE (IO,1560) IH1,IH2,(TABLE(J,I),J=1,2)	MPT07210
330	CONTINUE	MPT07220
	WRITE (IO,1570) TABLE(1,21)	MPT07230
C		MPT07240
C-->-->-->	SECTION I - EXECUTE FOR INPUT OF SIGNIFICANT SOURCE NUMBERS.	MPT07250
C		MPT07260
340	WRITE (IO,1580)	MPT07270
	IF (IOPT(7).EQ.0) GO TO 370	MPT07280
C		MPT07290
C	READ CARD TYPE 8 (SEE DESCRIPTION, SECTION B).	MPT07300
C		MPT07310
	READ (IN,1220) INPT,(MPS(I),I=1,INPT)	MPT07320
	WRITE (IO,1590) INPT,(MPS(I),I=1,INPT)	MPT07330
	IF (INPT.LE.NSIGP) GO TO 350	MPT07340
	WRITE (IO,1290) INPT,NSIGP	MPT07350
	STOP	MPT07360
350	IF (INPT.EQ.0) GO TO 370	MPT07370
	IF (MPS(INPT).EQ.0) WRITE (IO,1300)	MPT07380
	J=INPT+1	MPT07390
	K=1	MPT07400
C	ADD SIGNIFICANT SOURCES DETERMINED FROM RANKED SOURCE LIST	MPT07410
C	IF NSIGP GREATER THAN INPT.	MPT07420
	IF (J.GT.NSIGP) GO TO 390	MPT07430
	DO 360 I=J,NSIGP	MPT07440
	MPS(I)=IMPS(K)	MPT07450
360	K=K+1	MPT07460
	GO TO 390	MPT07470
370	DO 380 I=1,NSIGP	MPT07480
380	MPS(I)=IMPS(I)	MPT07490
390	WRITE (IO,1600) NPT,NSIGP,(MPS(I),I=1,NSIGP)	MPT07500
	IF (IOPT(6).EQ.0) GO TO 410	MPT07510
C	SAVE AVERAGE EMISSION RATE	MPT07520
	DO 400 I=1,NPT	MPT07530
400	PSAV(I)=SOURCE(IPOL,I)	MPT07540
C	FILL IN SIGNIFICANT POINT SOURCE ARRAY	MPT07550
410	DO 420 I=1,NSIGP	MPT07560
	J=MPS(I)	MPT07570
420	IPSIGS(J)=I	MPT07580
C		MPT07590
C-->-->-->	SECTION J - CHECK MET DATA IF FROM FILE OF ONE YEAR'S DATA.	MPT07600
C		MPT07610
	IF (IOPT(5).EQ.1) GO TO 450	MPT07620
C		MPT07630
C	READ CARD TYPE 9 (SEE DESCRIPTION, SECTION B).	MPT07640
C		MPT07650
	READ (IN,*) ISFCD,ISFCYR,IMXD,IMXYR	MPT07660
C	READ ID RECORD FROM PREPROCESSED MET DISK OR TAPE FILE.	MPT07670
	READ (11) ID,IYEAR,IDM,IYM	MPT07680
	IF (ISFCD.EQ.ID.AND.ISFCYR.EQ.IYEAR) GO TO 430	MPT07690
	WRITE (IO,1310) ISFCD,ISFCYR,ID,IYEAR	MPT07700

430	STOP	MPT07710
	IF (IMXD.EQ.IDM.AND.IMXYR.EQ.IYM) GO TO 440	MPT07720
	WRITE (IO,1320) IMXD,IMXYR,IDM,IYM	MPT07730
	STOP	MPT07740
440	WRITE (IO,1610) ISFCD,ISFCYR,IMXD,IMXYR	MPT07750
C		MPT07760
C-->-->-->	SECTION K - GENERATE POLAR COORDINATE RECEPTORS.	MPT07770
C		MPT07780
450	NRECEP=0	MPT07790
	WRITE (IO,1620)	MPT07800
	IF (IOPT(8).NE.1) GO TO 520	MPT07810
C		MPT07820
C	READ CARD TYPE 10 (SEE DESCRIPTION, SECTION B).	MPT07830
	READ (IN,*) RADIL,CENTX,CENTY	MPT07840
	JA=0	MPT07850
	DO 460 J=1,5	MPT07860
	IF (RADIL(J).EQ.0) GO TO 460	MPT07870
	JA=JA+1	MPT07880
460	CONTINUE	MPT07890
	WRITE (IO,1630) CENTX,CENTY,RADIL	MPT07900
	DO 480 I=1,36	MPT07910
C	CALCULATE THE ANGLE IN RADIAN	MPT07920
	RADIK=FLOAT(I)*0.1745329	MPT07930
C	0.1745329 IS 2*PI/36	MPT07940
	SINRAD=SIN(RADIK)	MPT07950
	COSRAD=COS(RADIK)	MPT07960
	DO 470 J=1,JA	MPT07970
	NRECEP=I+36*(J-1)	MPT07980
	RREC(NRECEP)=(RADIL(J)*SINRAD)+CENTX	MPT07990
C	CALCULATE THE EAST-COORDINATE	MPT08000
	SREC(NRECEP)=(RADIL(J)*COSRAD)+CENTY	MPT08010
C	CALCULATE THE NORTH-COORDINATE	MPT08020
	RNAME(1,NRECEP)=ANAME(I)	MPT08030
C	ALPHANUMERIC INFORMATION WHICH INDICATES DEGREES AZIMUTH	MPT08040
	ENCODE (4,1640,RNAME(2,NRECEP)) RADIL(J)	MPT08050
C	ENCODE THE FLOATING POINT VARIABLE OF RADIAL DISTANCE	MPT08060
C	TO ALPHANUMERIC REPRESENTATION SO INFO CAN BE PRINTED	MPT08070
	ZR(NRECEP)=0.	MPT08080
	ELR(NRECEP)=0.	MPT08090
470	CONTINUE	MPT08100
480	CONTINUE	MPT08110
	NRECEP=36*JA	MPT08120
C		MPT08130
C-->-->-->	SECTION L - READ POLAR COORDINATE ELEVATIONS.	MPT08140
C		MPT08150
	IF (IOPT(1).EQ.0) GO TO 520	MPT08160
C		MPT08170
C	READ 36 CARDS, TYPE 11 (SEE DESCRIPTION, SECTION 8).	MPT08180
C		MPT08190
	DO 510 I=1,36	MPT08200
	READ (IN,1230) IDUM,(ELRDUM(J),J=1,JA)	MPT08210
	IF (IDUM.EQ.I) GO TO 490	MPT08220
	WRITE (IO,1330) I,IDUM	MPT08230
	STOP	MPT08240
490	DO 500 J=1,JA	MPT08250
	K=J-1	MPT08260
	L=K*36+I	MPT08270
500	ELR(L)=ELRDUM(J)	MPT08280
510	CONTINUE	MPT08290
C		MPT08300
C-->-->-->	SECTION M - READ AND PROCESS RECEPTOR INFORMATION.	MPT08310
C		MPT08320
C	NOW READ CARD TYPE 12 IF NECESSARY. MUST HAVE A CARD WITH	MPT08330
C	'ENDR' IN COLS 1-4 TO INDICATE END OF RECEPTOR CARDS.	MPT08340
C	NO MORE THAN 180 RECEPTORS CAN BE INPUT TO MPTER.	MPT08350
C	START LOOP TO ENTER RECEPTORS.	MPT08360
520	NRECEP=NRECEP+1	MPT08370
	IF (NRECEP.LE.180) GO TO 540	MPT08380
	READ (IN,1200,END=530) DUM	MPT08390
		MPT08400

530	IF (DUM.EQ.ENDR) GO TO 550	MPT08410
	WRITE (IO,1340)	MPT08420
	STOP	MPT08430
C		MPT08440
C	READ CARD TYPE 12 (SEE DESCRIPTION, SECTION B).	MPT08450
C		MPT08460
540	READ (IN,1240) (RNAME(J,NRECEP),J=1,2),RREC(NRECEP),SREC(NRECEP),ZMPT08470	
	1R(NRECEP),ELR(NRECEP)	MPT08480
C	PLACE 'ENDR' IN COLS 1 TO 4 ON CARD FOLLOWING LAST RECEPTOR	MPT08490
C	TO END READING TYPE 12 CARDS.	MPT08500
	IF (RNAME(1,NRECEP).EQ.ENDR) GO TO 550	MPT08510
	GO TO 520	MPT08520
550	NRECEP=NRECEP-1	MPT08530
	IF (IOPT(1).EQ.0) GO TO 570	MPT08540
C	IF TERRAIN OPTION IS EMPLOYED, DETERMINE IF	MPT08550
C	RECEPTOR ELEVATIONS REQUIRE LABELING WITH ASTERISKS	MPT08560
C	FOR ADDITIONAL REMARKS.	MPT08570
	DO 560 J=1,NRECEP	MPT08580
	IF (ELR(J).GT.ELHN.OR.ELR(J).LT.ELW) STAR(2,J)=STR	MPT08590
	IF (ELR(J).GT.ELHN) STAR(1,J)=STR	MPT08600
560	CONTINUE	MPT08610
570	IF (NRECEP.GT.0) GO TO 580	MPT08620
	WRITE (IO,1350) NRECEP	MPT08630
	STOP	MPT08640
C	PRINT OUT TABLE OF RECEPTORS. ***	MPT08650
580	WRITE (IO,1650)	MPT08660
	DO 590 K=1,NRECEP	MPT08670
590	WRITE (IO,1660) K,STAR(1,K),STAR(2,K),(RNAME(J,K),J=1,2),RREC(K),SMPT08680	
	1REC(K),ZR(K),ELR(K)	MPT08690
	IF (IOPT(1).EQ.0) GO TO 600	MPT08700
	WRITE (IO,1670)	MPT08710
C		MPT08720
C->->->SECTION N - POSITION FILES AS REQUIRED.		MPT08730
C		MPT08740
600	IF (IOPT(20).EQ.0) GO TO 610	MPT08750
C		MPT08760
C	READ CARD TYPE 13 (SEE DESCRIPTION, SECTION B).	MPT08770
C		MPT08780
	READ (IN,*) IDAY,LDRUN	MPT08790
	WRITE (IO,1680) IDAY,LDRUN	MPT08800
	IF (IDAY.EQ.0) GO TO 610	MPT08810
C	READ INFO FOR HIGH-FIVE TABLE FROM LAST SEGMENT.	MPT08820
	READ (14) IDAYS,SUM,NHR,DAY1A,HRI,HMAXA,NDAY,IHR	MPT08830
	REWIND 14	MPT08840
	IF (IDAY.EQ.IDAYS) GO TO 610	MPT08850
	WRITE (IO,1360) IDAY,IDAYS	MPT08860
	STOP	MPT08870
610	NP=IDAY*(24/NAVG)	MPT08880
C	IF OPTION 21 = 1, WRITE INITIAL INFO TO UNIT 10	MPT08890
	IF (IOPT(21).EQ.1) WRITE (10) NPER,NAVG,LINE1,LINE2,LINE3	MPT08900
	IF (IOPT(22).EQ.0) GO TO 640	MPT08910
	IF (IDAY.LE.0) GO TO 630	MPT08920
C	SKIP PREVIOUSLY GENERATED HOURLY RECORDS.	MPT08930
	ISKIP=IDAY*24+2	MPT08940
	DO 620 I=1,ISKIP	MPT08950
620	READ (12)	MPT08960
	GO TO 640	MPT08970
C	WRITE LEAD TWO RECORDS ON HOURLY FILE.	MPT08980
630	WRITE (12) NPER,NAVG,LINE1,LINE2,LINE3	MPT08990
	WRITE (12) NRECEP,(RREC(I),I=1,NRECEP),(SREC(J),J=1,NRECEP)	MPT09000
640	IF (IOPT(23).EQ.0) GO TO 670	MPT09010
	IF (IDAY.LE.0) GO TO 660	MPT09020
C	SKIP PREVIOUSLY GENERATED AVERAGING-PERIOD FILE.	MPT09030
	ISKIP=NP+2	MPT09040
	DO 650 I=1,ISKIP	MPT09050
650	READ (13)	MPT09060
	GO TO 670	MPT09070
C	WRITE LEAD TWO RECORDS ON AVERAGING PERIOD FILE.	MPT09080
660	WRITE (13) NPER,NAVG,LINE1,LINE2,LINE3	MPT09090
	WRITE (13) NRECEP,(RREC(I),I=1,NRECEP),(SREC(J),J=1,NRECEP)	MPT09100

670	IF (IOPT(6).EQ.0) GO TO 690	MPT09110
	IF (IDAY.LE.0) GO TO 690	MPT09120
	ISKIP=IDAY*24	MPT09130
	DO 680 I=1,ISKIP	MPT09140
680	READ (15)	MPT09150
690	IDAY=IDATE(2)-1	MPT09160
	IF (IDAY.LE.0.OR.IOPT(5).EQ.1) GO TO 710	MPT09170
C	SKIP PREVIOUSLY USED HOURLY EMISSION RECORDS.	MPT09180
	DO 700 I=1,IDAY	MPT09190
700	READ (11)	MPT09200
710	CONTINUE	MPT09210
C		MPT09220
C-->-->SECTION O - START LOOPS FOR DAY AND AVG TIME; READ MET DATA.		MPT09230
C		MPT09240
720	IDAY=IDAY+1	MPT09250
	DAY=IDAY	MPT09260
	NHRS=0	MPT09270
	IF (IOPT(5).EQ.1) GO TO 760	MPT09280
C	IF OPTION 5 EQUALS ZERO, INPUT MET DATA OFF DISK (UNIT 11)	MPT09290
	READ (11) JYR,IMO,DAY1,IKST,QU,QTEMP,DUMR,QTHETA,HLH	MPT09300
	DO 781 JMI=1,24	MPT09310
	IDUMR(JMI)=DUMR(JMI)+0.5	MPT09320
781	CONTINUE	MPT09330
	IF (JYR.NE.IDATE(1)) GO TO 730	MPT09340
	IF (DAY1.EQ.DAY) GO TO 740	MPT09350
C	DATE ON MET TAPE DOES NOT MATCH INTERNAL DATE	MPT09360
730	WRITE (IO,1370) JYR,IDATE(2),IDATE(1),IDAY	MPT09370
	STOP	MPT09380
C	MODIFY WIND VECTOR BY 180 DEGREES. SINCE FLOW VECTORS WERE	MPT09390
C	OUTPUT FROM RAMMET. THIS CONVERTS BACK TO WIND DIRECTIONS.	MPT09400
740	IDATE(2)=DAY1	MPT09410
	DO 750 IQ=1,24	MPT09420
	IF (IKST(IQ).EQ.7) IKST(IQ)=6	MPT09430
	QTHETA(IQ)=QTHETA(IQ)+180.	MPT09440
	IF (QTHETA(IQ).GT.360.) QTHETA(IQ)=QTHETA(IQ)-360.	MPT09450
C	SELECT URBAN OR RURAL MIXING HEIGHTS AS APPROPRIATE.	MPT09460
	IF(MUOR.EQ.1)IMX=2	MPT09470
	IF(MUOR.EQ.2)IMX=1	MPT09480
750	QHL(IQ)=HLH(IMX,IQ)	MPT09490
760	NB=IHSTRT	MPT09500
	NE=NB+NAVG-1	MPT09510
	IF (NB.GT.0) GO TO 770	MPT09520
	WRITE (IO,1380) IHSTRT	MPT09530
	STOP	MPT09540
C	START LOOP FOR AVERAGING PERIOD.	MPT09550
770	U=0.0	MPT09560
	TEMP=0.0	MPT09570
	DELN=0.0	MPT09580
	DELM=0.0	MPT09590
	DO 780 I=1,7	MPT09600
780	IFREQ(I)=0.0	MPT09610
	DO 800 I=NB,NE	MPT09620
	JHR=I	MPT09630
	DAY2=IDATE(2)	MPT09640
	IF (IOPT(5).EQ.0) GO TO 790	MPT09650
C		MPT09660
C	READ CARD TYPE 14 IF IOPT(5) =1. (HOURLY MET DATA)	MPT09670
C	(SEE DESCRIPTION, SECTION B).	MPT09680
	READ (IN,*) JYR,DAY1,JHR,IKST(JHR),QU(JHR),QTEMP(JHR),QTHETA(JH	MPT09690
	IR),QHL(JHR)	MPT09700
	IF (I.NE.NB) GO TO 790	MPT09710
C	REDEFINE START HOURS AND DATES AT FIRST HOUR OF EACH	MPT09720
C	AVERAGING PERIOD IF READING HOURLY MET DATA.	MPT09730
	IDATE(1)=JYR	MPT09740
	IHSTRT=JHR	MPT09750
	ISTDAY=DAY1	MPT09760
	IDATE(2)=ISTDAY	MPT09770
	DAY2=IDATE(2)	MPT09780
790	IF (IKST(JHR).EQ.7) IKST(JHR)=6	MPT09790
		MPT09800

C	IF (IOPT(10).EQ.1) GO TO 800	MPT09810
C->->->	SECTION P - CALCULATE AND STORE FOR HIGH-FIVE TABLE.	MPT09820
C	IF (I.EQ.NB) WRITE (IO,1690) IDATE	MPT09830
	TRAD=QTHETA(JHR)*0.01745329	MPT09840
	WRITE (IO,1700) JHR,QTHETA(JHR),QU(JHR),QHL(JHR),QTEMP(JHR),IKST(JHR)	MPT09850
	SINT=SIN(TRAD)	MPT09860
	COST=COS(TRAD)	MPT09870
C	CALCULATE WIND COMPONENTS	MPT09880
	URES=QU(JHR)	MPT09890
	UR=URES*SINT	MPT09900
	VR=URES*COST	MPT09910
	DELM=DELM+UR	MPT09920
	DELN=DELN+VR	MPT09930
	TEMP=TEMP+QTEMP(JHR)	MPT09940
	U=U+URES	MPT09950
	KST=IKST(JHR)	MPT09960
	IFREQ(KST)=IFREQ(KST)+1	MPT09970
C	END LOOP TO READ ALL MET DATA FOR AVERAGING PERIOD.	MPT09980
800	CONTINUE	MPT09990
	IF (IOPT(10).EQ.1) GO TO 860	MPT10000
C	CALCULATE RESULTANT WIND DIRECTION THETA	MPT10010
	DELN=DELN/NAVG	MPT10020
	DELM=DELM/NAVG	MPT10030
	THETA=ANGARC(DELM,DELN)	MPT10040
C	CALCULATE AVERAGE AND RESULTANT SPEED AND PERSISTENCE.	MPT10050
	U=U/NAVG	MPT10060
	TEMP=TEMP/NAVG	MPT10070
	URES=SQRT(DELN*DELN+DELM*DELM)	MPT10080
	PERSIS=URES/U	MPT10090
C	DETERMINE MODAL AND AVERAGE STABILITY	MPT10100
	LSMAX=0	MPT10110
	DO 810 I=1,7	MPT10120
	LST=IFREQ(I)	MPT10130
	IF (LST.LE.LSMAX) GO TO 810	MPT10140
	LSMAX=LST	MPT10150
810	LSTAB=I	MPT10160
	CONTINUE	MPT10170
	IPL=LSTAB+1	MPT10180
	KST=LSTAB	MPT10190
	DO 820 I=IPL,7	MPT10200
	IF (LSMAX.EQ.IFREQ(I)) GO TO 830	MPT10210
820	CONTINUE	MPT10220
	GO TO 850	MPT10230
C	IF TIE FOR MAX MODAL STABILITY CALCULATE AVERAGE STABILITY	MPT10240
830	KSUM=0	MPT10250
	DO 840 J=1,7	MPT10260
840	KSUM=KSUM+IFREQ(J)*J	MPT10270
	KST=FLOAT(KSUM)/FLOAT(NAVG)+0.5	MPT10280
C	PRINT RESULTANT MET DATA SUMMARY FOR AVERAGING PERIOD.	MPT10290
850	WRITE (IO,1710)	MPT10300
	WRITE (IO,1720) THETA,URES,U,TEMP,PERSIS,KST	MPT10310
C	REDEFINE NB AND NE IN CASE NON-CONSECUTIVE DAYS ARE BEING RUN	MPT10320
860	IF (IOPT(5).EQ.0) GO TO 870	MPT10330
	NB=IHSTRT	MPT10340
	NE=IHSTRT+NAVG-1	MPT10350
C		MPT10360
C->->->	SECTION Q - INITIALIZE FOR HOURLY LOOP.	MPT10370
C		MPT10380
C	INITIALIZE SUMS FOR CONC AND PARTIAL CONC FOR AVG PERIOD.	MPT10390
870	DO 890 K=1,NRECEP	MPT10400
	PCHI(K)=0.0	MPT10410
	DO 880 I=1,26	MPT10420
880	PSIGS(K,I)=0.0	MPT10430
890	CONTINUE	MPT10440
C	IF SAVING PARTIAL CONCENTRATIONS, WRITE INITIAL RECEPTOR INFO.	MPT10450
	IF (IOPT(21).EQ.0) GO TO 900	MPT10460
	WRITE (10) NRECEP,NPT,(RREC(I),I=1,NRECEP),(SREC(I),I=1,NRECEP)	MPT10470
		MPT10480
		MPT10490
		MPT10500

C	C-->-->-->SECTION R - BEGIN HOURLY LOOP.	MPT10510
C		MPT10520
900	DO 1020 ILH=NB,NE	MPT10530
	LH=ILH	MPT10540
	IF (LH.LE.24) GO TO 910	MPT10550
	LH=MOD(ILH,24)	MPT10560
	IF (LH.EQ.1) IDATE(2)=DAY1	MPT10570
C	INITIALIZE SUMS FOR CONC AND PARTIAL CONC FOR HOURLY PERIODS.	MPT10580
910	DO 930 K=1,NRECEP	MPT10590
	PHCHI(K)=0.0	MPT10600
	DO 920 I=1,26	MPT10610
920	PHSIG(K,I)=0.0	MPT10620
930	CONTINUE	MPT10630
C	SET MET CONDITIONS FOR THIS HOUR	MPT10640
	THETA=QTHETA(LH)	MPT10650
	U=QU(LH)	MPT10660
	HL=QHL(LH)	MPT10670
	TEMP=QTEMP(LH)	MPT10680
	KST=IKST(LH)	MPT10690
	TRAD=THETA*0.01745329	MPT10700
	SINT=SIN(TRAD)	MPT10710
	COST=COS(TRAD)	MPT10720
	CTER=CONTER(KST)	MPT10730
C	IF OPTION 6 IS 1, READ HOURLY EMISSIONS.	MPT10740
	IF (IOPT(6).EQ.0) GO TO 940	MPT10750
	IDCK=IDATE(1)*100000+IDATE(2)*100+LH	MPT10760
	READ (15) IDATP,(SOURCE(IPOL,I),I=1,NPT)	MPT10770
C	CHECK DATE	MPT10780
	IF (IDCK.EQ.IDATP) GO TO 940	MPT10790
	WRITE (IO,1390) IDCK,IDATP	MPT10800
	STOP	MPT10810
C	CALCULATE POINT SOURCE CONTRIBUTIONS	MPT10820
940	CALL PTR	MPT10830
	IF (IOPT(22).EQ.0) GO TO 950	MPT10840
C	WRITE HOURLY CONCENTRATIONS TO TAPE	MPT10850
	WRITE (12) IDATE(2),LH,(PHCHI(I),I=1,NRECEP)	MPT10860
C		MPT10870
C-->-->-->SECTION S - CALCULATE AND STORE FOR HIGH-FIVE TABLE.		MPT10880
C		MPT10890
950	NHR=NHR+1	MPT10900
C	IF OPTION 19 IS 1, DELETE COMPUTATIONS FOR AVG CONC.	MPT10910
C	FOR LENGTH OF RECORD AND HIGH-FIVE TABLE.	MPT10920
	IF (IOPT(19).EQ.1) GO TO 1010	MPT10930
C	CUMULATE CONCENTRATIONS FOR AVG TIMES AND LENGTH OF RECORD.	MPT10940
C		MPT10950
C	FOR DEFAULT OPTION DETERMINE CALM HOURS.	MPT10960
C	FOR CALM HOURS, CONCENTRATIONS AT EACH RECEPTOR ARE	MPT10970
C	SET EQUAL TO ZERO.	MPT10980
C	--- A CALM HOUR IS AN HOUR WITH A WIND SPEED	MPT10990
C	OF 1.00 M/S AND A WIND DIRECTION THE SAME	MPT11000
C	AS THE PREVIOUS HOUR.	MPT11010
	IF(IOPT(25).EQ.1.AND.QU(LH).LT.1.009.AND.ITMIN1.EQ.	MPT11020
	*IDUMR(LH))THEN	MPT11030
	ICALM=ICALM+1	MPT11040
	DO 955 K=1,NRECEP	MPT11050
	PHCHI(K)=0.0	MPT11060
955	CONTINUE	MPT11070
	GO TO 971	MPT11080
	END IF	MPT11090
	DO 970 K=1,NRECEP	MPT11100
	DO 960 L=1,NAVT	MPT11110
960	CONC(K,L)=CONC(K,L)+PHCHI(K)	MPT11120
970	SUM(K)=SUM(K)+PHCHI(K)	MPT11130
C	STORE DATE FOR WHICH CONCS. HAVE BEEN CALCULATED.	MPT11140
	971 JDAY=IDATE(2)	MPT11150
C	SUBROUTINE RANK IS CALLED WHENEVER A COUNTER	MPT11160
C	INDICATES THAT ENOUGH END TO END HOURLY CONCENTRATIONS	MPT11170
C	HAVE BEEN STORED OFF TO COMPLETE AN AVG TIME.	MPT11180
C	NP3, NP8, NP24, NPX ARE USED AS COUNTERS FOR EACH	MPT11190
		MPT11200

C	AVG TIME AND ARE ZEROED AFTER EACH CALL TO RANK.	MPT11210
C	FOR THE DEFAULT OPTION CALCULATE AVERAGE	MPT11220
C	CONCENTRATION FOR APPROPRIATE AVERAGING PERIOD.	MPT11230
C	SET UP CALM FLAG FOR ENTRY INTO SUBROUTINE RANK.	MPT11240
C		MPT11250
	IF(IOPT(25).EQ.0) GOTO 979	MPT11260
	CALL RANK(1)	MPT11270
	NP3=NP3+1	MPT11280
	IF(QU(LH).LT.1.009.AND.IDUMR(LH).EQ.ITMIN1)ICFL3=1	MPT11290
	IF(NP3.NE.3) GO TO 974	MPT11300
C	FOR 3 HOUR AVERAGING PERIOD DIVIDE SUM BY 3.0.	MPT11310
	DO 972 LQ=1,NRECEP	MPT11320
972	CONC(LQ,2)=CONC(LQ,2)/3.0	MPT11330
	LL2=2	MPT11340
	IF(ICFL3.EQ.1)LL2=22	MPT11350
	CALL RANK(LL2)	MPT11360
	NP3=0	MPT11370
	ICFL3=0	MPT11380
974	NP8=NP8+1	MPT11390
	IDIV8=IDIV8+1	MPT11400
	IF(QU(LH).LT.1.009.AND.IDUMR(LH).EQ.ITMIN1)THEN	MPT11410
	IDIV8=IDIV8-1	MPT11420
	ICFL8=1	MPT11430
	END IF	MPT11440
	IF(NP8.NE.8)GO TO 976	MPT11450
	IF(IDIV8.LT.6)IDIV8=6	MPT11460
	DIV8=IDIV8	MPT11470
C	FOR 8 HOUR AVERAGING PERIOD DIVIDE THE SUM OF THE HOURLY	MPT11480
C	CONCENTRATIONS BY THE NUMBER OF NON-CALM HOURS OR 6.0	MPT11490
C	WHICHEVER IS GREATER.	MPT11500
	DO 975 LQ=1,NRECEP	MPT11510
975	CONC(LQ,3)=CONC(LQ,3)/DIV8	MPT11520
	LL3=3	MPT11530
	IF(ICFL8.EQ.1)LL3=33	MPT11540
	CALL RANK(LL3)	MPT11550
	NP8=0	MPT11560
	IDIV8=0	MPT11570
	ICFL8=0	MPT11580
976	NP24=NP24+1	MPT11590
	IDIV24=IDIV24+1	MPT11600
	IF(QU(LH).LT.1.009.AND.IDUMR(LH).EQ.ITMIN1)THEN	MPT11610
	IDIV24=IDIV24-1	MPT11620
	ICFL24=1	MPT11630
	END IF	MPT11640
	IF(NP24.NE.24)GO TO 1011	MPT11650
	IF(IDIV24.LT.18)IDIV24=18	MPT11660
	DIV24=IDIV24	MPT11670
C	FOR 24 HOUR AVERAGING PERIOD DIVIDE THE SUM OF THE HOURLY	MPT11680
C	CONCENTRATIONS BY THE NUMBER OF NON-CALM HOURS OR 18.	MPT11690
C	WHICHEVER IS GREATER.	MPT11700
	DO 977 LQ=1,NRECEP	MPT11710
977	CONC(LQ,4)=CONC(LQ,4)/DIV24	MPT11720
	LL4=4	MPT11730
	IF(ICFL24.EQ.1)LL4=44	MPT11740
	CALL RANK(LL4)	MPT11750
	NP24=0	MPT11760
	IDIV24=0	MPT11770
	ICFL24=0	MPT11780
1011	ITMIN1=IDUMR(LH)	MPT11790
	GO TO 1010	MPT11800
C		MPT11810
C	WHEN DEFAULT OPTION IS NOT USED, DETERMINE ENTRY INTO	MPT11820
C	SUBROUTINE RANK FOR APPROPRIATE AVERAGING PERIOD.	MPT11830
C	RANKING BASED ON HIGH AVERAGING PERIOD SUM.	MPT11840
C		MPT11850
979	CALL RANK (1)	MPT11860
	NP3=NP3+1	MPT11870
	IF (NP3.NE.3) GO TO 980	MPT11880
	CALL RANK (2)	MPT11890
		MPT11900

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980  NP3=0
      NP8=NP8+1
      IF (NP8.NE.8) GO TO 990
      CALL RANK (3)
      NP8=0
990  NP24=NP24+1
      IF (NP24.NE.24) GO TO 1000
      CALL RANK (4)
      NP24=0
1000 IF (NAV.T.EQ.4) GO TO 1010
      NPX=NPX+1
      IF (NPX.NE.NAV5) GO TO 1010
      CALL RANK (5)
      NPX=0
C
C->->->SECTION T - END HOURLY, AVERAGING TIME, AND DAILY LOOPS.
C
1010 IF (IOPT(11).EQ.1.AND.IOPT(14).EQ.1) GO TO 1020
C      IF BOTH OPTIONS 11 AND 14 CALL FOR OUTPUT DELETIONS,
C      SKIP HOURLY PRINTOUT.
      CALL OUTHR
1020 CONTINUE
C
C      END OF HOURLY LOOP
C
      IF (NE.GT.24) IDATE(2)=ISTDAY
C      OUTPUT FINAL RESULTS
      CALL OUTAVG
      NP=NP+1
      NHRS=NHRS+NAV
C      NEXT STATEMENT IS BRANCH FOR END OF RUN.
      IF (NP.GE.NPER) GO TO 1050
      IF (NHRS.LT.24) GO TO 1030
      IF (IOPT(20).EQ.0) GO TO 720
C      NEXT STATEMENT CHECKS FOR END OF SEGMENTED RUN.
      IF (IDAY.GE.LDRUN) GO TO 1040
      GO TO 720
C
C      END OF LOOP FOR CALENDAR DAYS
C
1030 NB=NB+NAV
      NE=NE+NAV
      IF (NB.LE.24) GO TO 770
      NB=MOD(NB,24)
      NE=NB+NAV-1
      GO TO 770
C
C      END OF LOOP FOR AVERAGING PERIOD.
C
C      IF SEGMENTED RUN, TEMPORARILY STORE
C      HIGH-FIVE INFO ON UNIT 14 FILE.
1040 WRITE (14) IDAY,SUM,NHR,DAY1A,HRL,HMAXA,NDAY,IHR
      WRITE (10,1730) IDAY
      GO TO 1140
1050 IF (IOPT(19).EQ.1) GO TO 1140
C
C->->->SECTION U - WRITE AVERAGE CONC. AND HIGH-FIVE TABLES.
C
C      IF OPTION 19 = 0, WRITE AVERAGE CONCENTRATION.
C      FOR LENGTH OF RECORD AND HIGH-FIVE TABLE.
      DO 1060 J=1,NRECEP
      STAR(1,J)=BLNK
      STAR(2,J)=BLNK
1060 CONTINUE
      WRITE (10,1400)(MODEL(K,MUOR),K=1,2), LINE1,LINE2,LINE3
      HR2=NE
C      FOR DEFAULT OPTION CALCULATE AND REPORT THE
C      NUMBER OF CALMS FOR AVERAGING PERIOD.
      IF (IOPT(25).EQ.1) THEN
      NHR=NHR-ICALM

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MPT11910
MPT11920
MPT11930
MPT11940
MPT11950
MPT11960
MPT11970
MPT11980
MPT11990
MPT12000
MPT12010
MPT12020
MPT12030
MPT12040
MPT12050
MPT12060
MPT12070
MPT12080
MPT12090
MPT12100
MPT12110
MPT12120
MPT12130
MPT12140
MPT12150
MPT12160
MPT12170
MPT12180
MPT12190
MPT12200
MPT12210
MPT12220
MPT12230
MPT12240
MPT12250
MPT12260
MPT12270
MPT12280
MPT12290
MPT12300
MPT12310
MPT12320
MPT12330
MPT12340
MPT12350
MPT12360
MPT12370
MPT12380
MPT12390
MPT12400
MPT12410
MPT12420
MPT12430
MPT12440
MPT12450
MPT12460
MPT12470
MPT12480
MPT12490
MPT12500
MPT12510
MPT12520
MPT12530
MPT12540
MPT12550
MPT12560
MPT12570
MPT12580
MPT12590
MPT12600

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	WRITE(6,1061)ICALM	
	END IF	MPT12610
	SUM(1)=SUM(1)/NHR	MPT12620
	HIMAX=SUM(1)	MPT12630
	KMX=1	MPT12640
C	INITIALIZE PERIODIC CONC TO BEGIN RANKING FOR PERIODIC MAX	MPT12650
	DO 1070 K=2,NRECEP	MPT12660
	SUM(K)=SUM(K)/NHR	MPT12670
	IF (SUM(K).LE.HIMAX) GO TO 1070	MPT12680
	KMX=K	MPT12690
	HIMAX=SUM(K)	MPT12700
1070	CONTINUE	MPT12710
	STAR(1,KMX)=STR	MPT12720
C	FIND HIGHEST AVERAGE CONC. AMONG RECEPTORS.	MPT12730
	WRITE (10,1740) DAY1A,HR1,DAY2,HR2	MPT12740
	DO 1080 K=1,NRECEP	MPT12750
1080	WRITE (10,1750) K, (RNAME(J,K),J=1,2),RREC(K),SREC(K),ZR(K),ELR(K),	MPT12760
	1STAR(1,K),SUM(K)	MPT12770
	STAR(1,KMX)=BLNK	MPT12780
C	LOOP TO WRITE HIGH-FIVE TABLE FOR 4 OR 5 AVG TIMES.	MPT12790
	DO 1130 L=1,NAVT	MPT12800
C	ASTERISKS DEPICT RECEPTORS WITH HIGHEST AND	MPT12810
C	SECOND HIGHEST CONCENTRATIONS.	MPT12820
	K1=1	MPT12830
	K2=1	MPT12840
	H11=HMAXA(1,1,L)	MPT12850
	H12=HMAXA(2,1,L)	MPT12860
	DO 1100 K=2,NRECEP	MPT12870
	IF (HMAXA(1,K,L).LE.H11) GO TO 1090	MPT12880
	H11=HMAXA(1,K,L)	MPT12890
	K1=K	MPT12900
1090	IF (HMAXA(2,K,L).LE.H12) GO TO 1100	MPT12910
	H12=HMAXA(2,K,L)	MPT12920
	K2=K	MPT12930
1100	CONTINUE	MPT12940
	STAR(1,K1)=STR	MPT12950
	STAR(2,K2)=STR	MPT12960
	IF((IOPT(25).EQ.1.AND.L.EQ.1).OR.(IOPT(25).NE.1))THEN	MPT12970
	WRITE (10,1760) NTIME(L),TITLE(IP),(I,I=1,5)	MPT12980
	END IF	MPT12990
	IF(IOPT(25).EQ.1.AND.L.NE.1)THEN	MPT13000
	WRITE (10,1761) NTIME(L),TITLE(IP),(I,I=1,5)	MPT13010
	END IF	MPT13020
	DUM=ATIME(L)	MPT13030
	DO 1120 K=1,NRECEP	MPT13040
C	SET CALM FLAG FOR PRINTING.	MPT13050
C	RESET HOUR VARIABLE FOR CALM HOURS.	MPT13060
	IF(IOPT(25).EQ.1)THEN	MPT13070
	DO 1112 J=1,5	MPT13080
	CF(J)=BLNK	MPT13090
	IF(IHR(J,K,L).GT.24)THEN	MPT13100
	IHR(J,K,L)=IHR(J,K,L)-100	MPT13110
	CF(J)=C	MPT13120
	END IF	MPT13130
1112	CONTINUE	MPT13140
	END IF	MPT13150
	IF(IOPT(25).EQ.1)GO TO 1111	MPT13160
C	CALCULATE AVERAGE CONCENTRATIONS WHEN	MPT13170
C	DEFAULT OPTION IS NOT ON.	MPT13180
	DO 1110 J=1,5	MPT13190
1110	HMAXA(J,K,L)=HMAXA(J,K,L)/DUM	MPT13200
1111	WRITE (10,1770) K,RREC(K),SREC(K),(STAR(J,K),HMAXA(J,K,L),CF(J),	MPT13210
	1NDAY(J,K,L),IHR(J,K,L),J=1,2),(HMAXA(J,K,L),CF(J),NDAY(J,K,L),	MPT13220
	2IHR(J,K,L),J=3,5)	MPT13230
1120	CONTINUE	MPT13240
C	INITIALIZE ASTERISK STORAGE TO BLANKS.	MPT13250
	STAR(1,K1)=BLNK	MPT13260
	STAR(2,K2)=BLNK	MPT13270
1130	CONTINUE	MPT13280
C		MPT13290
		MPT13300

RECORD TYPE 1 (ONE FOR EACH HOUR OF SIMULATION) MPT14010
 IDATP DATE-TIME INDICATOR CONSISTING OF YEAR, JULIAN DAY, MPT14020
 AND HOUR: YYDDHH. MPT14030
 SOURCE(IPOL,I),I=1,NPT EMISSION RATE FOR THE POLLUTANT IPOL MPT14040
 FOR EACH SOURCE, GRAMS PER SECOND. MPT14050
 MPT14060
 MPT14070
 C*** OUTPUT PUNCHED CARDS (UNIT 1) AVERAGE CONCENTRATIONS (PUNCHED IF MPT14080
 IOPT(24)=1) MPT14090
 MPT14100
 CARD TYPE 1 (ONE FOR EACH RECEPTOR FOR EACH AVERAGING TIME) MPT14110
 MPT14120
 CC:1-4 WORD'CNTRL' PUNCHED MPT14130
 CC:5 BLANK MPT14140
 CC:6-15 RREC EAST COORDINATE OF RECEPTOR, USER UNITS MPT14150
 CC:16-25 SREC NORTH COORDINATE OF RECEPTOR, USER UNITS MPT14160
 CC:26-35 GWU CONCENTRATION FOR AVERAGING TIME, MICROG/M**3MPT14170
 CC:36-55 BLANK MPT14180
 CC:56-59 K RECEPTOR NUMBER MPT14190
 CC:60-69 ZR RECEPTOR HEIGHT ABOVE GROUND, METERS MPT14200
 CC:70-79 ELR RECEPTOR GROUND-LEVEL ELEVATION, USER HT UNITSMPT14210
 MPT14220
 C*** OUTPUT FILE (UNIT 10) PARTIAL CONCENTRATIONS (USED IF IOPT(21)=1) MPT14230
 MPT14240
 RECORD TYPE 1 MPT14250
 MPT14260
 NPER NUMBER OF PERIODS MPT14270
 NAVG NUMBER OF HOURS IN AVERAGING PERIOD. MPT14280
 LINE1(14) 80 ALPHANUMERIC CHARACTERS FOR TITLE. MPT14290
 LINE2(14) 80 ALPHANUMERIC CHARACTERS FOR TITLE. MPT14300
 LINE3(14) 80 ALPHANUMERIC CHARACTERS FOR TITLE. MPT14310
 MPT14320
 RECORD TYPE 2 (FROM MPTER) (ONE FOR EACH AVERAGING PERIOD) MPT14330
 MPT14340
 NRECEP NUMBER OF RECEPTORS MPT14350
 NPT NUMBER OF SOURCES MPT14360
 RREC(I),I=1,NRECEP EAST COORDINATE OF RECEPTOR, USER UNITS MPT14370
 SREC(I),I=1,NRECEP NORTH COORDINATE OF RECEPTOR, USER UNITS MPT14380
 MPT14390
 RECORD TYPE 3 (ONE FOR EACH RECEPTOR FOR EACH SIMULATED HOUR, MPT14400
 FROM PTR) MPT14410
 MPT14420
 IDATE YEAR AND JULIAN DAY MPT14430
 LH HOUR MPT14440
 K RECEPTOR NUMBER MPT14450
 PARTC(J),J=1,NPT CONCENTRATION AT RECEPTOR K FROM SOURCE J, MPT14460
 G/M**3. MPT14470
 MPT14480
 C*** OUTPUT FILE (UNIT 12) HOURLY CONCENTRATIONS (USED IF IOPT(22)=1) MPT14490
 MPT14500
 RECORD 1 MPT14510
 MPT14520
 NPER NUMBER OF PERIODS MPT14530
 NAVG NUMBER OF HOURS IN AVERAGING PERIOD. MPT14540
 LINE1(14) 80 ALPHANUMERIC CHARACTERS FOR TITLE. MPT14550
 LINE2(14) 80 ALPHANUMERIC CHARACTERS FOR TITLE. MPT14560
 LINE3(14) 80 ALPHANUMERIC CHARACTERS FOR TITLE. MPT14570
 MPT14580
 RECORD 2 MPT14590
 MPT14600
 NRECEP NUMBER OF RECEPTORS. MPT14610
 RREC(I),I=1,NRECEP EAST COORDINATE OF RECEPTOR, USER UNITS MPT14620
 SREC(I),I=1,NRECEP NORTH COORDINATE OF RECEPTOR, USER UNITS MPT14630
 MPT14640
 RECORD TYPE 3 (ONE FOR EACH SIMULATED HOUR) MPT14650
 MPT14660
 IDATE(2) JULIAN DAY MPT14670
 LH HOUR MPT14680
 PHCHI(I),I=1,NRECEP HOURLY CONCENTRATION FOR EACH RECEPTOR, MPT14690
 MPT14700

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C
C
C      G/M**3.
C*** OUTPUT FILE (UNIT 13) AVERAGING-PERIOD CONCENTRATIONS (USED IF
C      IOPT(23)=1)
C
C      RECORD 1
C
C      NPER      NUMBER OF PERIODS
C      NAVG      NUMBER OF HOURS IN AVERAGING PERIOD.
C      LINE1(14) 80 ALPHANUMERIC CHARACTERS FOR TITLE.
C      LINE2(14) 80 ALPHANUMERIC CHARACTERS FOR TITLE.
C      LINE3(14) 80 ALPHANUMERIC CHARACTERS FOR TITLE.
C
C      RECORD 2
C
C      NRECEP      NUMBER OF RECEPTORS.
C      RREC(I),I=1,NRECEP EAST COORDINATE OF RECEPTOR, USER UNITS
C      SREC(I),I=1,NRECEP NORTH COORDINATE OF RECEPTOR, USER UNITS
C
C      RECORD TYPE 3 (ONE FOR EACH SIMULATED AVERAGING PERIOD)
C
C      IDATE(2)    JULIAN DAY
C      NB          ENDING HOUR OF PERIOD
C      PCHI(K),K=1,NRECEP AVERAGING PERIOD CONCENTRATION FOR EACH
C                      RECEPTOR, G/M**3.
C*** TEMPORARY FILE (UNIT 14) VALUES FOR HIGH-FIVE TABLES (USED IF
C      IOPT(20)=1)
C
C      ONLY RECORD
C
C      NDAY(ON WRITE)  NUMBER OF DAYS PROCESSED
C      IDAYS(ON READ)  NUMBER OF DAYS PREVIOUSLY PROCESSED
C      SUM(180)        CUMULATION OF LONG-TERM CONCENTRATION, (G/M**3)
C      NHR             NUMBER OF HOURS PROCESSED
C      DAY1A           JULIAN DAY OF START OF LENGTH OF RECORD.
C      HR1             START HOUR OF LENGTH OF RECORD
C      HMAXA(3,5,180,5) HIGHEST FIVE CONCENTRATIONS (G/M**3), AND
C                      ASSOCIATED DAY AND HOUR, FOR EACH RECEPTOR,
C                      FOR FIVE DIFFERENT AVERAGING TIMES.
C->->->->SECTION W - FORMAT STATEMENTS.
C
C      INPUT FORMATS
C
C      1061 FORMAT(5X,T98,'# CALMS FOR PERIOD: ',I4)
C      1180 FORMAT(20A4/20A4/20A4)
C      1200 FORMAT(A4)
C      1210 FORMAT(3A4,8F8.2,F4.0)
C      1220 FORMAT(26I3)
C      1230 FORMAT(I2,8X,5F10.0)
C      1240 FORMAT(2A4,2F10.3,2F10.0)
C
C      ERROR STATEMENT FORMATS
C
C      1250 FORMAT(1X,' NSIGP (THE NO. OF SIGNF POINT SOURCES) WAS FOUND',
C      10 EXCEED THE LIMIT (25). USER TRIED TO INPUT ',I3,' SOURCES',
C      2 *****EXECUTION TERMINATED*****')
C      1260 FORMAT(1H0,'CONTER VALUE IS OUTSIDE OF RANGE: ',ZERO TO ONE. EXEMPT
C      1CUTION TERMINATED.')
C      1270 FORMAT(' USER TRIED TO INPUT MORE THAN ',I4,' POINT SOURCES. THIS
C      1 GOES BEYOND THE CURRENT PROGRAM DIMENSIONS.')

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MPT14710
MPT14720
MPT14730
MPT14740
MPT14750
MPT14760
MPT14770
MPT14780
MPT14790
MPT14800
MPT14810
MPT14820
MPT14830
MPT14840
MPT14850
MPT14860
MPT14870
MPT14880
MPT14890
MPT14900
MPT14910
MPT14920
MPT14930
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MPT14970
MPT14980
MPT14990
MPT15000
MPT15010
MPT15020
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MPT15070
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MPT15090
MPT15100
MPT15110
MPT15120
MPT15130
MPT15140
MPT15150
MPT15160
MPT15170
MPT15180
MPT15190
MPT15200
MPT15210
MPT15220
MPT15230
MPT15240
MPT15250
MPT15260
MPT15270
MPT15280
MPT15290
MPT15300
MPT15310
MPT15320
MPT15330
MPT15340
MPT15350
MPT15360
MPT15370
MPT15380
MPT15390
MPT15400

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1 YEAR=' ,I2,' ) DO NOT AGREE WITH THE PREPROCESSOR OUTPUT FILE',/1XMPT15410
2 (STATION=' ,I5,' ,YEAR=' ,I2) MPT15420
1320 FORMAT (' MIXING HEIGHT IDENTIFIERS READ INTO MODEL (STATION=' ,I5 MPT15430
1X ,YEAR=' ,I2,' ) DO NOT AGREE WITH THE PREPROCESSOR OUTPUT FILE',/1MPT15440
2X (STATION=' ,I5,' ,YEAR=' ,I2) MPT15450
1330 FORMAT (1H0,' WRONG RECEPTOR ELEVATION CARD READ.', 'READ CARD FOR MPT15460
1AZIMUTH ' ,I3,' SHOULD HAVE BEEN ' ,I3,' ) MPT15470
1340 FORMAT (1X,' ****USER EITHER TRIED TO INPUT MORE THAN 180 ' ,RECEPTMPT15480
1ORS OR ENDREC WAS NOT PLACED AFTER THE LAST RECEPTOR ' ,CARD****'/MPT15490
2*****EXECUTION TERMINATED*****') MPT15500
1350 FORMAT (1X,' NO RECEPTORS HAVE BEEN CHOSEN') MPT15510
1360 FORMAT (1H0,' ***DAYS DO NOT MATCH, IDAY = ' ,I4,' , IDAYS = ' ,I4) MPT15520
1370 FORMAT (' DATE ON MET. TAPE, ' ,I2,I3,' ,DOES NOT MATCH INTERNAL DAMPT15530
1TE, ' ,I2,I3) MPT15540
1380 FORMAT (' HOUR ' ,I3,' IS NOT PERMITTED. HOURS MUST BE DEFINED BETW MPT15550
1EEN 1 AND 24') MPT15560
1390 FORMAT (' DATE BEING PROCESSED IS= ' ,I8/1X,' DATE OF HOURLY POINT EMPT15570
1MISSION RECORD IS = ' ,I8/1X,' ***PLEASE CHECK EMISSION RECORDS***') MPT15580
C MPT15590
C MPT15600
C MPT15610
OUTPUT FORMATS MPT15620
1395 FORMAT ('0',T35,A4,A1,1X,'MPTER - VERSION 85165'/1X,20A4/1X,20A4/ MPT15630
*1X,20A4) MPT15640
1400 FORMAT ('1',T40,A4,A1,1X,'MPTER - VERSION 85165'/1X,20A4/1X,20A4/ MPT15650
*1X,20A4) MPT15660
1410 FORMAT (1H0,T30,'GENERAL INPUT INFORMATION'//2X,'THIS RUN OF MPTERMPT15670
1-VERSION 85165 IS FOR ' ,THE POLLUTANT ' ,A4,' FOR ' ,I3,1X,I3,' -HOUTMPT15680
2R PERIODS.'/2X,' CONCENTRATION ESTIMATES BEGIN ON HOUR-' ,I2,' , JULIMPT15690
3AN DAY-' ,I3,' ,YEAR-' ,I2,' ,/1X,' A FACTOR OF ' ,F14.7,' HAS BEENMPT15700
4 SPECIFIED TO ' ,CONVERT USER LENGTH UNITS TO KILOMETERS.'/1X,I3,'MPT15710
5 SIGNIFICANT SOURCES ARE TO BE CONSIDERED.') MPT15720
1420 FORMAT (1H,' THIS RUN WILL NOT CONSIDER ANY POLLUTANT LOSS.') MPT15730
1430 FORMAT (1H,2X,' A HALF-LIFE OF ' ,F10.2,' (SECONDS) HAS BEEN ASSUMEMPT15740
1D BY THE USER.') MPT15750
1440 FORMAT (1X,' HIGH-FIVE SUMMARY CONCENTRATION TABLES ' ,WILL BE OUTMPT15760
1PUT FOR ' ,I3,' AVERAGING PERIODS.'/ ,AVG TIMES ' ,OF' 1,3,8, AND 2MPT15770
24 HOURS ARE AUTOMATICALLY DISPLAYED.') MPT15780
1450 FORMAT (1H,2X,' A FACTOR OF ' ,F14.7,' HAS BEEN SPECIFIED TO CONVERMPT15790
1T USER HEIGHT UNITS TO METERS.') MPT15800
1460 FORMAT (1H0,T3,'OPTION ' ,T16,'OPTION LIST' ,T46,'OPTION SPECIFICATMPT15810
1ION : 0= IGNORE OPTION'/1X,T68,' 1= USE OPTION'/T25,' TECHNICAL OPTMPT15820
2IONS'/1X,T7,I2,T16,' TERRAIN ADJUSTMENTS' ,T70,I1/1X,T7,I2,T16,' DO NMPT15830
3OT INCLUDE STACK DOWNWASH CALCULATIONS' ,T70,I1/1X,T7,I2,T16,' DO NMPT15840
4T INCLUDE GRADUAL PLUME RISE CALCULATIONS' ,T70,I1/1X,T7,I2,T16,' CAMPT15850
5LCULATE INITIAL PLUME SIZE' ,T70,I1/1X,T25,' INPUT OPTIONS'/1X,T7,I2MPT15860
6,T16,' READ MET DATA FROM CARDS' ,T70,I1/1X,T7,I2,T16,' READ HOURLY EMPT15870
7MISSIONS' ,T70,I1/1X,T7,I2,T16,' SPECIFY SIGNIFICANT SOURCES' ,T70,I1MPT15880
8/1X,T7,I2,T16,' READ RADIAL DISTANCES TO GENERATE RECEPTORS' ,T70,I1MPT15890
9/T25,' PRINTED OUTPUT OPTIONS'/1X,T7,I2,T16,' DELETE EMISSIONS WITH MPT15900
AHEIGHT TABLE' ,T70,I1/1X,T7,I2,T16,' DELETE MET DATA SUMMARY FOR AVGMPT15910
B PERIOD' ,T70,I1/1X,T7,I2,T16,' DELETE HOURLY CONTRIBUTIONS' ,T70,I1MPT15920
C1X,T7,I2,T16,' DELETE MET DATA ON HOURLY CONTRIBUTIONS' ,T70,I1/1X,TMPT15930
D7,I2,T16,' DELETE FINAL PLUME RISE CALC ON HRLY CONTRIBUTIONS' ,T70,MPT15940
E11) MPT15950
1470 FORMAT (1X,T7,I2,T16,' DELETE HOURLY SUMMARY' ,T70,I1/1X,T7,I2,T16,'MPT15960
1DELETE MET DATA ON HRLY SUMMARY' ,T70,I1/1X,T7,I2,T16,' DELETE FINALMPT15970
2 PLUME RISE CALC ON HRLY SUMMARY' ,T70,I1/1X,T7,I2,T16,' DELETE AVGMPT15980
3PERIOD CONTRIBUTIONS' ,T70,I1/1X,T7,I2,T16,' DELETE AVERAGING PERIODMPT15990
4 SUMMARY' ,T70,I1/1X,T7,I2,T16,' DELETE AVG CONCENTRATIONS AND HI-5 MPT16000
5TABLES' ,T70,I1/T25,' OTHER CONTROL AND OUTPUT OPTIONS'/1X,T7,I2,T16MPT16010
6,' RUN IS PART OF A SEGMENTED RUN' ,T70,I1/1X,T7,I2,T16,' WRITE PARTIMPT16020
7AL CONC TO DISK OR TAPE' ,T70,I1/1X,T7,I2,T16,' WRITE HOURLY CONC TOMPT16030
8 DISK OR TAPE' ,T70,I1/1X,T7,I2,T16,' PUNCH AVG-PERIOD CONC TO DISK MPT16040
9OR TAPE' ,T70,I1/1X,T7,I2,T16,' PUNCH AVG-PERIOD CONC ONTO CARDS' ,T7MPT16050
A0,I1/T25,' DEFAULT OPTION ' ,1X,T7,I2,T16, MPT16060
B' USE DEFAULT OPTION' ,T70,I1) MPT16070
1480 FORMAT (1H0,2X,' ANEMOMETER HEIGHT= ' ,F10.2/3X,' WIND PROFILE WITH 'MPT16080
1,' HEIGHT EXPONENTS CORRESPONDING TO STABILITY ARE AS FOLLOWS:'/8X,MPT16090
2,' FOR STABILITY A: ' ,F4.2/12X,' STABILITY B: ' ,F4.2/12X,' STABILITY CMPT16100
3: ' ,F4.2/12X,' STABILITY D: ' ,F4.2/12X,' STABILITY E: ' ,F4.2/12X,'MPT16110

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4STABILITY F: ',F4.2)
1490 FORMAT (IHO,'ANEMOMETER HEIGHT IS:',F10.2/1X,'EXPONENTS FOR POWER-MPT16110
1 LAW WIND INCREASE WITH HEIGHT ARE:',F4.2,5(' ',F4.2)'/ TERRAIN ADMPT16120
2JUSTMENTS ARE:',F5.3,5(' ',F5.3)'/)
1500 FORMAT ('1',T40,'POINT SOURCE INFORMATION'//1X,T5,'SOURCE',T23,'EAMPT16140
1ST',T31,'NORTH',T39,'SO2(G/SEC) PART(G/SEC) STACK STACK',T23,'EAMPT16150
2 STACK',3X,'POTEN. IMPACT',2X,'EFF',3X,'GRD-LVL BUOY FLUX'/1X,T2MPT16160
33,'COORD',T31,'COORD', EMISSIONS EMISSIONS HT(M) TEMP(K) DMPT16170
4IAM(M)',VEL(M/SEC)(MICRO G/M**3) HT(M)',3X,'ELEV',6X,'F'/1X,T24,'MPT16180
5(USER UNITS)',T116,'USER HT M**4/S**3'/1X,T117,'UNITS'//)
1510 FORMAT (1X,I3,1X,3A4,1X,2F9.2,2F12.2,4F8.2,6PF13.2,0PF9.2,2F9.2) MPT16200
1520 FORMAT ('0',T3,'SIGNIFICANT',A4,'POINT SOURCES'//1X,T8,'RANK',T2MPT16210
12,'CHI-MAX',T33,'SOURCE NO.'/1X,T17,'(MICROGRAMS/M**3)'/1X) MPT16220
1530 FORMAT (1X,T9,I3,T18,6PF12.2,T35,I3) MPT16230
1540 FORMAT (1X,'HEIGHT ABOVE 100M FOR POINT SOURCE',I4,3X,' HEIGHT=',FMPT16240
16.2,'(METERS)', EMISSIONS=',F10.2,'(G/SEC)',) MPT16250
1550 FORMAT ('0',4X,'TOTAL',A4,'EMISSION AND CUMULATIVE FRACTION ACCOMPT16260
1RDING TO HEIGHT'//1X,T12,'TOTAL POINT CUMULATIVE '/1X,'HEIGHT(M)MPT16270
2 EMISSIONS(G/S) FRACTION'/1X) MPT16280
1560 FORMAT (1X,T2,I2,'-',I3,T11,F8.2,T26,F7.3,T41,F8.2,T56,F7.3) MPT16290
1570 FORMAT ('0',T2,'TOTAL',2X,F10.2) MPT16300
1580 FORMAT (IHO,21X,'ADDITIONAL INFORMATION ON SOURCES.') MPT16310
1590 FORMAT (IHO,'USER SPECIFIED',I3,'(NPT) SIGNIFICANT POINT ',SOMPT16320
1URCES AS LISTED BY POINT SOURCE NUMBER: '/2X,25I5) MPT16330
1600 FORMAT ('0',2X,'EMISSION INFORMATION FOR',I4,'(NPT) POINT SOUR',MPT16340
1'CES HAS BEEN INPUT'/2X,I2,' SIGNIFICANT POINT SOURCES(NSIGP)',AMPT16350
2RE TO BE', USED FOR THIS RUN'/2X,'THE ORDER OF SIGNIFICANCE(IMP)MPT16360
3 FOR 25 OR LESS POINT SOURCES USED IN THIS RUN AS LISTED BY POINT MPT16370
4SOURCE NUMBER: '/2X,25I5) MPT16380
1610 FORMAT (2X,'SURFACE MET DATA FROM STATION(ISFCD)',I6,' YEAR(ISFCMPT16390
1YR) 19',I2/2X,' MIXING HEIGHT DATA FROM STATION(IMXD)',I6,' YEAR(MPT16400
2IMXYR) 19',I2) MPT16410
1620 FORMAT (IHO,T21,'RECEPTOR INFORMATION') MPT16420
1630 FORMAT (IHO,'MPTER INTERNALLY GENERATES 36 RECEPTORS ',ON A CIRCUMPT16430
1LE CORRESPONDING TO EACH NON-ZERO',RADIAL DISTANCE FROM A CENTERMPT16440
2 POINT '/1X,T10,'COORDINATES ARE (USER UNITS): ('F8.3','F8.3')MPT16450
3/1X,T10,'RADIAL DISTANCE(S) USER SPECIFIED (USER UNITS):',5(F11.3MPT16460
4,)) MPT16470
1640 FORMAT (F4.1) MPT16480
1650 FORMAT ('0', RECEPTOR IDENTIFICATION EAST NORTH RECEPTMPT16490
1TOR HT RECEPTOR GROUND LEVEL'/1X,T30,'COORD',T39,'COORD ABV LMPT16500
2OCAL GRD LVL ELEVATION'/1X,T31,'(USER UNITS) (METERMPT16510
3S) (USER HT UNITS)'/1X) MPT16520
1660 FORMAT (1X,T3,I3,2A1,8X,2A4,F13.3,F10.3,F10.1,F20.1) MPT16530
1670 FORMAT (IHO,T3,'* ONE ASTERISK INDICATES THAT THE ASSOCIATED ',REMP16540
1CEPTOR(S) HAVE A GROUND LEVEL ELEVATION LOWER',THAN THE LOWEST SMPT16550
2OURCE BASE ELEVATION.'/ CAUTION SHOULD',BE USED IN INTERPRETINGMPT16560
3 CONCENTRATIONS FOR THESE RECEPTORS.'/ ** TWO ASTERISKS',INDICMPT16570
4ATE THAT THE ASSOCIATED RECEPTOR(S) HAVE GROUND LEVEL',ELEVATIONMPT16580
5S ABOVE THE LOWEST STACK TOP.'/ CONSEQUENTLY', NO CALCULATIONMPT16590
6S WILL BE PERFORMED WITH THIS RECEPTOR.A',SERIES OF ASTERISKS WIMPT16600
7LL INSTEAD APPEAR IN THE OUTPUT.') MPT16610
1680 FORMAT (/1X,' THE NUMBER OF DAYS PREVIOUSLY COMPLETED EQUAL ',MPT16620
1I3,' AND THE LAST DAY TO BE COMPLETED IN THIS RUN IS',I3) MPT16630
1690 FORMAT ('INPUT MET DATA',I2,'/',I4/1X,T2,'HOUR THETA SPEEDMPT16640
1 MIXING TEMP STABILITY'/1X,T9,'(DEG) (M/S) HEIGHT(M) (MPT16650
2DEG-K) CLASS'/1X) MPT16660
1700 FORMAT (1X,T3,I2,4F9.2,6X,I1) MPT16670
1710 FORMAT ('0',RESULTANT MET CONDITIONS'/1X) MPT16680
1720 FORMAT (2X,'WIND DIRECTION=',F7.2,T36,'RESULTANT WIND SPEED=',F7.2MPT16690
1/2X,'AVERAGE WIND SPEED=',F7.2,T36,'AVERAGE TEMP=',F7.2/2X,'WIND MPT16700
2ERSISTENCE=',F6.3,T36,'MODAL STABILITY=',I2) MPT16710
1730 FORMAT (IHO,' THIS SEGMENT OF A SEGMENTED RUN HAS COMPLETED',I5,' MPT16720
1(IDAY) DAYS.') MPT16730
1740 FORMAT ('0',T9,' RECEPTORS'//1X,'RECEPTOR IDENTIFICATION MPT16740
1EAST NORTH RECEPTOR HT RECEPTOR GROUND LEVEL',T99,'AVGMPT16750
2 CONC FOR PERIOD'/1X,T30,'COORD',T39,'COORD ABV LOCAL GRD LVL PMPT16760
3 ELEVATION',T94,'DAY',F4.0,'HR',F3.0,' TO DAY',F4.0,'HR',F3.0/1XMPT16770
4,T31,'(USER UNITS) (METERS) (USER HT UNITS)',T100,'MPT16780
5(MICROGRAMS/M**3)'/1X) MPT16790
MPT16800

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1750 FORMAT (1X,T3,I3,10X,2A4,5X,F8.2,2X,F8.2,F10.1,F20.1,T110,A1,6PF7.MPT16810
12) MPT16820
1760 FORMAT (1H1,T29,'FIVE HIGHEST ',I2,'-HOUR ',A4,' CONCENTRATIONS((EMPT16830
INDING ON JULIAN DAY, HOUR)'/1X,T55,'(MICROGRAMS/M**3)'/2X,'RECEPTMPT16840
20R',T38,4(11,20X),11,1X) MPT16850
1761 FORMAT (1H1,T29,'FIVE HIGHEST ',I2,'-HOUR ',A4,' CONCENTRATIONS((EMPT16860
INDING ON JULIAN DAY, HOUR)'/1X,T55,'(MICROGRAMS/M**3)'/
21X,T36,'C-FLAG IDENTIFIES CONCENTRATIONS AFFECTED BY CALM HOURS'//MPT16870
32X,'RECEPTOR ',T38,4(11,20X),11,1X) MPT16880
1770 FORMAT (1H,2X,I3,1,('F7.2',,F7.2,')',2(1X,A1,6PF9.2,A1,1X,('',IMPT16890
13,','',I2,')'),3(2X,6PF9.2,A1,1X,('',I3,','',I2,')')) MPT16900
C MPT16910
END MPT16920
C MPT16930
BLOCK DATA
C BLOCK DATA (VERSION 79365), PART OF MPTER. MPT16950
COMMON /EXPOS/ PXUCOF(6,9),PXUEXP(6,9),HC1(10),BXUCOF(6,9),BXUEXP MPT16960
*6,9) MPT16970
****COEFFICIENTS GENERATED WITH RURAL SIGMAS USING PGYZ MPT16980
****RELATIVE CONC. NORMALIZED FOR WIND SPEED FROM PT SOURCE, CHI*U/Q, = MPT16990
C**** PXUCOF(KST,IH)*H**PXUEXP(KST,IH) MPT17000
C**** IH=1 FOR H LESS THAN 20 METERS. MPT17010
C**** IH=2 FOR H FROM 20 TO 30 METERS. MPT17020
C**** IH=3 FOR H FROM 30 TO 50 METERS. MPT17030
C**** IH=4 FOR H FROM 50 TO 70 METERS. MPT17040
C**** IH=5 FOR H FROM 70 TO 100 METERS. MPT17050
C**** IH=6 FOR H FROM 100 TO 200 METERS. MPT17060
C**** IH=7 FOR H FROM 200 TO 300 METERS. MPT17070
C**** IH=8 FOR H FROM 300 TO 500 METERS. MPT17080
C**** IH=9 FOR H GREATER THAN 500 METERS. MPT17090
DATA PXUCOF /.10401E+00,.12133E+00,.14273E+00,.15351E+00,.18855E+00MPT17100
10,.18668E+00,.77533E-01,.11728E+00,.14120E+00,.18239E+00,.20458E+00MPT17110
20,.34326E+00,.67228E-01,.10013E+00,.13963E+00,.19162E+00,.38998E+00MPT17120
30,.76271E+00,.40484E-01,.75308E-01,.13784E+00,.54357E+00,.72550E+00MPT17130
40,.22936E+01,.28539E-01,.66936E-01,.13615E+00,.52790E+00,.12908E+00MPT17140
51,.56943E+01,.14792E-01,.65799E-01,.13315E+00,.74832E+00,.28818E+00MPT17150
61,.40940E+03,.12403E-01,.64321E-01,.12927E+00,.10826E+01,.77020E+00MPT17160
72,.23011E+05,.12340E-01,.62874E-01,.12546E+00,.15580E+01,.68810E+00MPT17170
83,.46522E+06,.12245E-01,.60615E-01,.11952E+00,.22517E+01,.42842E+00MPT17180
93,.00000E+00/ MPT17190
DATA PXUEXP /-.19460E+01,-.19774E+01,-.20086E+01,-.20742E+01,-.218MPT17200
122E+01,-.22176E+01,-.18479E+01,-.19661E+01,-.20050E+01,-.21317E+01MPT17210
2,-.22094E+01,-.24209E+01,-.18060E+01,-.19196E+01,-.20017E+01,-.214MPT17220
362E+01,-.23991E+01,-.26556E+01,-.16763E+01,-.18468E+01,-.19984E+01MPT17230
4,-.24128E+01,-.25578E+01,-.29371E+01,-.15940E+01,-.18191E+01,-.199MPT17240
555E+01,-.24059E+01,-.26934E+01,-.31511E+01,-.14513E+01,-.18153E+01MPT17250
6,-.19907E+01,-.24817E+01,-.28678E+01,-.40795E+01,-.14181E+01,-.181MPT17260
711E+01,-.19851E+01,-.25514E+01,-.34879E+01,-.48399E+01,-.14172E+01MPT17270
8,-.18071E+01,-.19799E+01,-.26152E+01,-.38719E+01,-.53670E+01,-.141MPT17280
960E+01,-.18012E+01,-.19721E+01,-.26744E+01,-.37956E+01,-.17020E+02MPT17290
A/ MPT17300
C MPT17310
****COEFFICIENTS GENERATED WITH URBAN SIGMAS USING BRSYSZ & BRSZ MPT17320
C**** FROM RAM MODEL. MPT17330
C****RELATIVE CONCENTRATIONS NORMALIZED FOR WIND SPEED FROM POINT MPT17340
C**** SOURCE, CHI*U/Q, =BXUCOF(KST,IH)*H**BXUEXP(KST,IH) MPT17350
C**** IH=1 FOR H LESS THAN 20 METERS. MPT17360
C**** IH=2 FOR H FROM 20 TO 30 METERS. MPT17370
C**** IH=3 FOR H FROM 30 TO 50 METERS. MPT17380
C**** IH=4 FOR H FROM 50 TO 70 METERS. MPT17390
C**** IH=5 FOR H FROM 70 TO 100 METERS. MPT17400
C**** IH=6 FOR H FROM 100 TO 200 METERS. MPT17410
C**** IH=7 FOR H FROM 200 TO 300 METERS. MPT17420
C**** IH=8 FOR H FROM 300 TO 500 METERS. MPT17430
C**** IH=9 FOR H GREATER THAN 500 METERS. MPT17440
C MPT17450
DATA BXUCOF /.16808E+00,.16808E+00,.20927E+00,.20378E+00,.18861E+00MPT17460
10,.18861E+00,.15945E+00,.15945E+00,.20527E+00,.20229E+00,.21253E+00MPT17470
20,.21253E+00,.14777E+00,.14777E+00,.19871E+00,.20011E+00,.24888E+00MPT17480
30,.24888E+00,.13262E+00,.13262E+00,.18908E+00,.19685E+00,.30041E+00MPT17500

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40,.30041E+00,.11745E+00,.11745E+00,.17767E+00,.19301E+00,.34521E+0MPT17510
50,.34521E+00,.91943E-01,.91943E-01,.15327E+00,.18499E+00,.34368E+0MPT17520
60,.34368E+00,.65533E-01,.65533E-01,.11984E+00,.17445E+00,.23640E+0MPT17530
70,.23640E+00,.47345E-01,.47345E-01,.89821E-01,.16720E+00,.15537E+0MPT17540
80,.15537E+00,.29993E-01,.29993E-01,.56100E-01,.16747E+00,.11009E+0MPT17550
90,.11009E+00/ MPT17560
DATA BXUEXP /-.19722E+01,-.19722E+01,-.19896E+01,-.19965E+01,-.206MPT17570
149E+01,-.20649E+01,-.19546E+01,-.19546E+01,-.19831E+01,-.19940E+01MPT17580
2,-.21047E+01,-.21047E+01,-.19322E+01,-.19322E+01,-.19736E+01,-.199MPT17590
308E+01,-.21512E+01,-.21512E+01,-.19045E+01,-.19045E+01,-.19609E+01MPT17600
4,-.19867E+01,-.21993E+01,-.21993E+01,-.18759E+01,-.18759E+01,-.194MPT17610
562E+01,-.19820E+01,-.22320E+01,-.22320E+01,-.18228E+01,-.18228E+01MPT17620
6,-.19142E+01,-.19728E+01,-.22310E+01,-.22310E+01,-.17589E+01,-.175MPT17630
789E+01,-.18677E+01,-.19617E+01,-.21604E+01,-.21604E+01,-.17019E+01MPT17640
8,-.17019E+01,-.18172E+01,-.19543E+01,-.20868E+01,-.20868E+01,-.162MPT17650
984E+01,-.16284E+01,-.17414E+01,-.19545E+01,-.20314E+01,-.20314E+01MPT17660
A/ MPT17670
DATA HCL /10.,20.,30.,50.,70.,100.,200.,300.,500.,1000./ MPT17680
END MPT17690
C MPT17700
C
FUNCTION ANGARC (DELM,DELN) MPT17720
C FUNCTION ANGARC (VERSION 79365), PART OF MPTR. MPT17730
C DETERMINES APPROPRIATE ANGLE OF TAN(ANG) = DELM/DELN MPT17740
C WHICH IS REQUIRED FOR CALCULATION OF RESULTANT WIND DIRECTION. MPT17750
C DELM IS THE AVERAGE WIND COMPONENT IN THE EAST DIRECTION. MPT17760
C DELN IS THE AVERAGE WIND COMPONENT IN THE NORTH DIRECTION. MPT17770
C NO COMMON REQUIREMENT, NO ARRAYS, USES LIBRARY FUNCTION ATAN MPT17780
IF (DELM) 10,40,80 MPT17790
IF (DELN) 20,30,20 MPT17800
20 ANGARC=57.29578*ATAN(DELM/DELN)+180. MPT17810
RETURN MPT17820
30 ANGARC=180. MPT17830
RETURN MPT17840
40 IF (DELM) 50,60,70 MPT17850
50 ANGARC=270. MPT17860
RETURN MPT17870
60 ANGARC=0. MPT17880
C ANGARC=0. INDICATES INDETERMINATE ANGLE MPT17890
RETURN MPT17900
70 ANGARC=090. MPT17910
RETURN MPT17920
80 IF (DELM) 90,100,110 MPT17930
90 ANGARC=57.29578*ATAN(DELM/DELN)+360. MPT17940
RETURN MPT17950
100 ANGARC=360. MPT17960
RETURN MPT17970
110 ANGARC=57.29578*ATAN(DELM/DELN) MPT17980
RETURN MPT17990
C MPT18000
END MPT18010
C
SUBROUTINE PTR MPT18030
C SUBROUTINE PTR (VERSION 81350), PART OF MPTR. MPT18040
C THE PURPOSE OF THIS ROUTINE IS TO CALCULATE CONCENTRATIONS FROM MPT18050
C POINT SOURCES. MPT18060
C-->-->-->SECTION PTR.A - COMMON AND DIMENSION. MPT18070
C MPT18080
COMMON /MPOR/ IOPT(25) MPT18090
COMMON /MPO/ NRECEP, NAVG, NB, LH, NPT, IDATE(2), RREC(180), SREC(180), ZRMPT18100
1(180), ELR(180), PHCHI(180), PHSIGS(180,26), HSAV(250), DSAV(250), PCHI(MPT18110
2180), PSIGS(180,26), IPOL MPT18120
COMMON /MPR/ UPL, Z, H, HL, X, Y, KST, DELH, SY, SZ, RC, MUOR MPT18130
COMMON /MP/ SOURCE(9,250), CONTWO, PSAV(250), IPSIGS(250), U, TEMP, SINTMPT18140
1, COST, PL(6), ELP(250), ELHN, HANE, TLOS, CELM, CTER MPT18150
DIMENSION UPH(250), HPR(250), FP(250), DH(250), PARTC(250) MPT18160
C MPT18170
C-->-->-->SECTION PTR.B - INITIALIZE AND START RECEPTOR LOOP. MPT18180
C MPT18190
MPT18200

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C	ZERO EFFECTIVE STACK HEIGHT FOR EACH SOURCE	MPT18210
C	NPT - THE NUMBER OF POINT SOURCES	MPT18220
C	DO 10 J=1,NPT	MPT18230
C	HSAV WILL BE USED TO STORE THE SOURCE PLUME HEIGHTS.	MPT18240
10	HSAV(J)=0.0	MPT18250
C	LOOP ON RECEPTORS	MPT18260
C	NRECEP - THE NUMBER OF RECEPTORS	MPT18270
C	DO 180 K=1,NRECEP	MPT18280
C	IF IOPT(1)=1, TERRAIN ADJUSTMENTS ARE MADE.	MPT18290
C	IF (IOPT(1).EQ.0) GO TO 20	MPT18300
C	ELR - RECEPTOR GROUND LEVEL ELEVATION	MPT18310
C	ER=ELR(K)	MPT18320
C	ELHN - LOWEST SOURCE STACK-TOP ELEVATION?	MPT18330
C	IF (ER.LE.ELHN) GO TO 20	MPT18340
C	PCHI(K)=99999.E+26	MPT18350
C	PHCHI(K)=99999.E+26	MPT18360
C	GO TO 180	MPT18370
20	CONTINUE	MPT18380
C	ZR - RECEPTOR HEIGHT ABOVE GROUND	MPT18390
C	Z=ZR(K)	MPT18400
C	C-->-->-->SECTION PTR.C - START SOURCES LOOP, CALCULATE	MPT18410
C	UPWIND AND CROSSWIND DISTANCES.	MPT18420
C	DO 170 J=1,NPT	MPT18430
C	PARTC(J)=0.0	MPT18440
C	RQ - EAST COORDINATE OF THE SOURCE	MPT18450
C	RQ=SOURCE(1,J)	MPT18460
C	SQ - NORTH COORDINATE OF THE SOURCE	MPT18470
C	SQ=SOURCE(2,J)	MPT18480
C	ELP - SOURCE GROUND LEVEL ELEVATION	MPT18490
C	EP=ELP(J)	MPT18500
C	DETERMINE UPWIND DISTANCE	MPT18510
C	XDUM,YDUM IN USER UNITS. X,Y IN KM.	MPT18520
C	RREC - EAST COORDINATE OF THE RECEPTOR	MPT18530
C	XDUM=RQ-RREC(K)	MPT18540
C	SREC - NORTH COORDINATE OF THE RECEPTOR	MPT18550
C	YDUM=SQ-SREC(K)	MPT18560
C	SINT AND COST ARE THE SIN AND COS OF THE WIND DIRECTION	MPT18570
C	CONTWO - MULTIPLIER CONSTANT TO CONVERT USER UNITS TO KM	MPT18580
C	X=(YDUM*COST+XDUM*SINT)*CONTWO	MPT18590
C	X IS THE UPWIND DISTANCE OF THE SOURCE FROM THE RECEPTOR.	MPT18600
C	IF X IS NEGATIVE, INDICATING THAT THE SOURCE IS DOWNWIND OF	MPT18610
C	THE RECEPTOR, THE CALCULATION IS TERMINATED ASSUMING NO	MPT18620
C	CONTRIBUTION FROM THAT SOURCE.	MPT18630
C	IF (X.LE.0.0) GO TO 170	MPT18640
C	DETERMINE CROSSWIND DISTANCE	MPT18650
C	Y=(YDUM*SINT-XDUM*COST)*CONTWO	MPT18660
C	H=HSAV(J)	MPT18670
C	SKIP PLUME RISE CALCULATION IF EFFECTIVE HT. HAS ALREADY BEEN	MPT18680
C	CALCULATED FOR THIS SOURCE	MPT18690
C	IF (H.EQ.0.0) GO TO 30	MPT18700
C	DELH=DH(J)	MPT18710
C	C-->-->-->SECTION PTR.D - EXTRAPOLATE WIND SPEED TO STACK TOP	MPT18720
C	CALCULATE PLUME RISE.	MPT18730
C	GO TO 110	MPT18740
C	MODIFY WIND SPEED BY POWER LAW PROFILE IN ORDER TO TAKE INTO	MPT18750
C	ACCOUNT THE INCREASE OF WIND SPEED WITH HEIGHT.	MPT18760
C	ASSUME WIND MEASUREMENTS ARE REPRESENTATIVE FOR HEIGHT = HANE.	MPT18770
C	THT IS THE PHYSICAL STACK HEIGHT	MPT18780
30	THT=SOURCE(5,J)	MPT18790
C	POINT SOURCE HEIGHT NOT ALLOWED TO BE LESS THAN 1 METER.	MPT18800
C	IF (THT.LT.1.) THT=1.	MPT18810
C	U - WIND SPEED AT HEIGHT 'HANE'	MPT18820
C	PL - POWER FOR THE WIND PROFILE	MPT18830
C		MPT18840
C		MPT18850
C		MPT18860
C		MPT18870
C		MPT18880
C		MPT18890
C		MPT18900

C	UPL - WIND AT THE PHYSICAL STACK HEIGHT	MPT18910
C	UPL=U*(THT/HANE)**PL(KST)	MPT18920
C	WIND SPEED NOT ALLOWED TO BE LESS THAN 1 METER/SEC.	MPT18930
C	IF (UPL.LT.1.) UPL=1.	MPT18940
C	STORE THE STACK TOP WIND FOR THE JTH SOURCE FOR THIS HOUR	MPT18950
	UPH(J)=UPL	MPT18960
	VS=SOURCE(8,J)	MPT18970
	BUOY=SOURCE(9,J)	MPT18980
	TS=SOURCE(6,J)	MPT18990
C	TEMP- THE AMBIENT AIR TEMPERATURE FOR THIS HOUR	MPT19000
	DELT=TS-TEMP	MPT19010
	F=BUOY*DELT/TS	MPT19020
C	IOPT(6) HOURLY EMISSION INPUT FROM TAPE/DISK? 0=NO, 1=YES.	MPT19030
C	IF (IOPT(6).EQ.0) GO TO 40	MPT19040
C	MODIFY EXIT VELOCITY AND BUOYANCY BY RATIO OF HOURLY EMISSIONS	MPT19050
C	TO AVERAGE EMISSIONS	MPT19060
	SCALE = SOURCE(IPOL,J)/PSAV(J)	MPT19070
	VS = VS*SCALE	MPT19080
	F = F*SCALE	MPT19090
40	D=SOURCE(7,J)	MPT19100
C	*****PLUME RISE AND STACK TIP DOWNWASH CALCULATIONS	MPT19110
C		MPT19120
C	CALCULATE H PRIME WHICH TAKES INTO ACCOUNT STACK DOWNWASH	MPT19130
C	BRIGGS(1973) PAGE 4	MPT19140
	HPRM=THT	MPT19150
C	IF IOPT(2)=1 THEN NO STACK DOWNWASH COMPUTATION	MPT19160
	IF (IOPT(2).EQ.1) GO TO 50	MPT19170
	DUM=VS/UPL	MPT19180
	IF (DUM.LT.1.5) HPRM=THT+2.*D*(DUM-1.5)	MPT19190
C	'HPRM' IS BRIGGS' H-PRIME	MPT19200
	IF (HPRM.LT.0.) HPRM=0.	MPT19210
C		MPT19220
C	CALCULATE PLUME RISE	MPT19230
C	MOMENTUM RISE EQUATION	MPT19240
C		MPT19250
50	DELHM=3.*VS*D/UPL	MPT19260
	IF(KST.GT.4)GO TO 70	MPT19270
C		MPT19280
C	PLUME RISE FOR NEUTRAL - UNSTABLE CONDITIONS	MPT19290
C		MPT19300
	IF(TS.LT.TEMP)GO TO 80	MPT19310
	IF(F.GE.55.)GO TO 60	MPT19320
C		MPT19330
C	COMBINATION OF BRIGG'S(1971) EQNS. 6&7, PAGE 1031, FOR F<55.	MPT19340
	DELH=21.425*F**0.75/UPL	MPT19350
	IF(DELHM.GT.DELH)GO TO 80	MPT19360
	DISTF=0.049*F**0.625	MPT19370
	GO TO 100	MPT19380
C		MPT19390
C	COMBINATION OF BRIGG'S(1971) EQNS. 6&7, PAGE 1031, FOR F>=55.	MPT19400
C		MPT19410
60	DELH=38.71*F**0.6/UPL	MPT19420
	IF(DELHM.GT.DELH)GO TO 80	MPT19430
	DISTF=0.119*F**0.4	MPT19440
	GO TO 100	MPT19450
C		MPT19460
C	PLUME RISE FOR STABLE CONDITIONS	MPT19470
C		MPT19480
70	DTHDZ=0.02	MPT19490
	IF(KST.GT.5)DTHDZ=0.035	MPT19500
	S=9.80616*DTHDZ/TEMP	MPT19510
C		MPT19520
C	MOMENTUM RISE EQUATION	MPT19530
C	BRIGG'S(1969) EQUATION 4.28, PAGE 59	MPT19540
C		MPT19550
	DHA=1.5*(VS*VS*D*D*TEMP/(4.*TS*UPL))**0.333333/S**0.166667	MPT19560
	IF(DHA.LT.DELHM)DELHM=DHA	MPT19570
	IF(TS.LT.TEMP)GO TO 80	MPT19580
		MPT19590
		MPT19600

C			MPT19610
C		STABLE, BUOYANT RISE (WITH WIND)	MPT19620
C		DELH=2.6*(F/(UPL*S))*0.333333	MPT19630
		IF(DELHM.GT.DELH)GO TO 80	MPT19640
		DISTF=0.0020715*UPL/SQRT(S)	MPT19650
		GO TO 100	MPT19660
80		DELH=DELHM	MPT19670
		DISTF=0.	MPT19680
100		H=HPRM+DELH	MPT19690
105		HSAV(J)=H	MPT19700
		DH(J)=DELH	MPT19710
		DSAV(J)=DISTF	MPT19720
		UPH(J)=UPL	MPT19730
		HPR(J)=HPRM	MPT19740
		FP(J)=F	MPT19750
C		IF SOURCE-RECEPTOR DISTANCE IS GREATER OR EQUAL TO DISTANCE TO	MPT19760
C		FINAL RISE, SKIP PLUME RISE CALCULATION AND USE FINAL RISE.	MPT19770
110		IF (X.GE.DSAV(J)) GO TO 120	MPT19780
		IF (IOPT(4).EQ.0.AND.IOPT(3).EQ.1) GO TO 120	MPT19790
C		CALCULATE GRADUAL PLUME RISE IF (1) THE USER SPECIFIES SO,	MPT19800
C		OR (2) USER EMPLOYS CALCULATION OF INITIAL DISPERSION.....	MPT19810
C		IN THIS CASE, USE OF FINAL EFFECTIVE HEIGHT IN THE CALCULATION	MPT19820
C		OF DISPERSION COEFFICIENTS COULD LEAD TO MISLEADING VALUES SINCE	MPT19830
C		SIGMA-Y, -Z = DELTA-H/3.5	MPT19840
C		DELH=160.*FP(J)**0.333333*X**0.666667/UPH(J)	MPT19850
C		PLUME RISE FOR DISTANCE X(160 IS 1.6*1000**.67 BECAUSE X IN KM)	MPT19860
		IF (DELH.GT.DH(J)) DELH=DH(J)	MPT19870
		IF (IOPT(3).EQ.1) GO TO 120	MPT19880
C		IF SPECIFYING CALCULATION OF INITIAL DISPERSION BUT ARE NOT	MPT19890
C		SPECIFYING CALCULATION OF GRADUAL PLUME RISE, THEN DO NOT	MPT19900
C		ADD THE NEW GRADUAL DELTA-H TO THE EFFECTIVE HEIGHT. OTHERWISE,	MPT19910
C		CHECK THE GRADUAL RISE PLUME HEIGHT WITH FINAL EFFECTIVE HEIGHT	MPT19920
C		AND SET THE PLUME HEIGHT TO THE SMALLER OF THE TWO VALUES.	MPT19930
		H=HPR(J)+DELH	MPT19940
C		ADD PLUME RISE TO STACK HEIGHT FOR TOTAL EFFECTIVE STACK HT.	MPT19950
C		END PLUME RISE CALCULATION	MPT19960
120		UPL=UPH(J)	MPT19970
C			MPT19980
C		SECTION PTR.E - CALCULATE THE CONTRIBUTION OF	MPT19990
C		ONE SOURCE TO ONE RECEPTOR.	MPT20000
C			MPT20010
		IF(KST.GT.4)GOTO130	MPT20020
		IF (H.LT.HL) GO TO 130	MPT20030
		PROD=0.	MPT20040
		GO TO 150	MPT20050
C		IF IOPT(1) = 1, TERRAIN ADJUSTMENTS ARE MADE	MPT20060
130		IF (IOPT(1).EQ.0) GO TO 140	MPT20070
		DUM=ER-EP	MPT20080
		H=H+CELM*(CTER*DUM-DUM)	MPT20090
C		RCP RETURNS THE DISPERSION PARAMETERS, SY AND SZ (METERS)	MPT20100
C		AND THE RELATIVE CONCENTRATION VALUES CHI/Q (SEC/M**3)	MPT20110
140		CALL RCP	MPT20120
C		CALCULATE TRAVEL TIME IN KM-SEC/M TO INCLUDE DECAY RATE OF	MPT20130
C		POLLUTANT.	MPT20140
		TT=X/UPL	MPT20150
C		TLOS IN METERS/KM-SEC, SO TT*TLOS IS DIMENSIONLESS	MPT20160
C		INCLUDE THE POLLUTANT LOSS	MPT20170
		PROD=RC*SOURCE(IPOL,J)/EXP(TT*TLOS)	MPT20180
C		IF HAFL IS ZERO, TLOS WILL START AS ZERO AND	MPT20190
C		RESULT IN NO COMPUTATION OF POLLUTANT LOSS.	MPT20200
C		INCREMENT CONCENTRATION AT K-TH RECEPTOR(G/M**3)	MPT20210
C		PCHI - SUM FOR THE AVERAGING TIME AT RECEPTOR K	MPT20220
150		PCHI(K)=PCHI(K)+PROD	MPT20230
C		PHCHI - CONCENTRATION FOR THIS HOUR AT RECEPTOR K	MPT20240
		PHCHI(K)=PHCHI(K)+PROD	MPT20250
		KSIG=IPSIGS(J)	MPT20260
		IF (KSIG.EQ.0) GO TO 160	MPT20270
C		STORE CONCENTRATIONS FROM SIGNIFICANT SOURCES.(G/M**3)	MPT20280
		PSIGS(K,KSIG)=PSIGS(K,KSIG)+PROD	MPT20290
			MPT20300

C	NOTE THAT MIXING HEIGHT- THE TOP OF THE NEUTRAL OR UNSTABLE LAYER-	MPT21010
C	HAS A VALUE ONLY FOR STABILITIES 1-4, THAT IS, MIXING HEIGHT,	MPT21020
C	THE HEIGHT OF THE NEUTRAL OR UNSTABLE LAYER, DOES NOT EXIST FOR STABLE	MPT21030
C	LAYERS AT THE GROUND SURFACE- STABILITY 5 OR 6.	MPT21040
C	THE ABOVE EQUATION IS SIMILAR TO EQUATION (5.8) P 36 IN	MPT21050
C	WORKBOOK OF ATMOSPHERIC DISPERSION ESTIMATES WITH THE ADDITION	MPT21060
C	OF THE EXPONENTIAL INVOLVING Y.	MPT21070
C	IF STABLE, SKIP CONSIDERATION OF MIXING HEIGHT.	MPT21080
	IF (KST.GE.5) GO TO 50	MPT21090
C	IF THE SOURCE IS ABOVE THE LID, SET RC = 0., AND RETURN.	MPT21100
	IF (H.GT.HL) GO TO 20	MPT21110
	IF (Z-HL) 50,50,40	MPT21120
20	IF (Z.LT.HL) GO TO 40	MPT21130
	WRITE (IO,470)	MPT21140
40	RC=0.	MPT21150
	RETURN	MPT21160
C	IF X IS LESS THAN 1 METER, SET RC=0. AND RETURN. THIS AVOIDS	MPT21170
C	PROBLEMS OF INCORRECT VALUES NEAR THE SOURCE.	MPT21180
50	IF (X.LT.0.001) GO TO 40	MPT21190
C	CALL PGYZ TO OBTAIN VALUES FOR SY AND SZ	MPT21200
	CALL PGYZ	MPT21210
C	SY = SIGMA Y, THE STANDARD DEVIATION OF CONCENTRATION IN THE	MPT21220
C	Y-DIRECTION (M)	MPT21230
C	SZ = SIGMA Z, THE STANDARD DEVIATION OF CONCENTRATION IN THE	MPT21240
C	Z-DIRECTION (M)	MPT21250
C	IF IOPT(4)=1, CONSIDER BUOYANCY INDUCED DISPERSION OF PLUME DUE	MPT21260
	TO TURBULENCE DURING BUOYANT RISE.	MPT21270
	IF (IOPT(4).EQ.0) GO TO 70	MPT21280
	DUM=DELH/3.5	MPT21290
	DUM=DUM*DUM	MPT21300
	SY=SQRT(SY*SY+DUM)	MPT21310
	SZ=SQRT(SZ*SZ+DUM)	MPT21320
70	C1=1.	MPT21330
	IF (Y.EQ.0.0) GO TO 100	MPT21340
	YD=1000.*Y	MPT21350
C	YD IS CROSSWIND DISTANCE IN METERS.	MPT21360
	DUM=YD/SY	MPT21370
	TEMP=0.5*DUM*DUM	MPT21380
	IF (TEMP.GE.50.) GO TO 40	MPT21390
	C1=EXP(TEMP)	MPT21400
100	IF (KST.GT.4) GO TO 120	MPT21410
	IF (HL.LT.5000.) GO TO 200	MPT21420
C	IF STABLE CONDITION OR UNLIMITED MIXING HEIGHT,	MPT21430
C	USE EQUATION 3.2 IF Z = 0, OR EQ 3.1 FOR NON-ZERO Z.	MPT21440
C	(EQUATION NUMBERS REFER TO WORKBOOK OF ATMOSPHERIC DISPERSION	MPT21450
C	ESTIMATES.)	MPT21460
120	C2=2.*SZ*SZ	MPT21470
	IF (Z) 40,130,150	MPT21480
C	NOTE: AN ERRONEOUS NEGATIVE Z WILL RESULT IN ZERO CONCENTRATIONS	MPT21490
C	C-->-->SECTION RCP.C - STABLE OR UNLIMITED MIXING, Z IS ZERO.	MPT21500
C		MPT21510
130	C3=H*H/C2	MPT21520
	IF (C3.GE.50.) GO TO 40	MPT21530
	A2=1./EXP(C3)	MPT21540
C	WADE EQUATION 3.2.	MPT21550
	RC=A2/(3.14159*UPL*SY*SZ*C1)	MPT21560
	RETURN	MPT21570
C		MPT21580
C	C-->-->SECTION RCP.D - STABLE OR UNLIMITED MIXING, Z IS NON-ZERO.	MPT21590
C		MPT21600
150	A2=0.	MPT21610
	A3=0.	MPT21620
	CA=Z-H	MPT21630
	CB=Z+H	MPT21640
	C3=CA*CA/C2	MPT21650
	C4=CB*CB/C2	MPT21660
	IF (C3.GE.50.) GO TO 170	MPT21670
	A2=1./EXP(C3)	MPT21680
170	IF (C4.GE.50.) GO TO 190	MPT21690
		MPT21700

C	A3=1./EXP(C4)	MPT21710
190	WADE EQUATION 3.1.	MPT21720
	RC=(A2+A3)/(6.28318*UPL*SY*SZ*C1)	MPT21730
	RETURN	MPT21740
C		MPT21750
C->->->->	SECTION RCP.E - UNSTABLE, ASSURED OF UNIFORM MIXING.	MPT21760
C		MPT21770
C	IF SIGMA-Z IS GREATER THAN 1.6 TIMES THE MIXING HEIGHT,	MPT21780
C	THE DISTRIBUTION BELOW THE MIXING HEIGHT IS UNIFORM WITH	MPT21790
C	HEIGHT REGARDLESS OF SOURCE HEIGHT OR RECEPTOR HEIGHT BECAUSE	MPT21800
C	OF REPEATED EDDY REFLECTIONS FROM THE GROUND AND THE MIXING HT	MPT21810
200	IF (SZ/HL.LE.1.6) GO TO 220	MPT21820
C	WADE EQUATION 3.5.	MPT21830
	RC=1./(2.5066*UPL*SY*HL*C1)	MPT21840
	RETURN	MPT21850
C	INITIAL VALUE OF AN SET = 0.	MPT21860
C	AN - THE NUMBER OF TIMES THE SUMMATION TERM IS EVALUATED	MPT21870
C	AND ADDED IN.	MPT21880
220	AN=0.	MPT21890
	IF (Z) 40,380,230	MPT21900
C		MPT21910
C->->->->	SECTION RCP.F - UNSTABLE, CALCULATE MULTIPLE EDDY	MPT21920
C	REFLECTIONS, Z IS NON-ZERO.	MPT21930
C		MPT21940
C	STATEMENTS 220-260 CALCULATE RC, THE RELATIVE CONCENTRATION,	MPT21950
C	USING THE EQUATION DISCUSSED ABOVE. SEVERAL INTERMEDIATE	MPT21960
C	VARIABLES ARE USED TO AVOID REPEATING CALCULATIONS.	MPT21970
C	CHECKS ARE MADE TO BE SURE THAT THE ARGUMENT OF THE	MPT21980
C	EXPONENTIAL FUNCTION IS NEVER GREATER THAN 50 (OR LESS THAN	MPT21990
C	-50).	MPT22000
C	CALCULATE MULTIPLE EDDY REFLECTIONS FOR RECEPTOR HEIGHT Z.	MPT22010
230	A1=1./(6.28318*UPL*SY*SZ*C1)	MPT22020
	C2=2.*SZ*SZ	MPT22030
	A2=0.	MPT22040
	A3=0.	MPT22050
	CA=Z-H	MPT22060
	CB=Z+H	MPT22070
	C3=CA*CA/C2	MPT22080
	C4=CB*CB/C2	MPT22090
	IF (C3.GE.50.) GO TO 250	MPT22100
250	A2=1./EXP(C3)	MPT22110
	IF (C4.GE.50.) GO TO 270	MPT22120
270	A3=1./EXP(C4)	MPT22130
	SUM=0.	MPT22140
280	THL=2.*HL	MPT22150
	AN=AN+1.	MPT22160
	A4=0.	MPT22170
	A5=0.	MPT22180
	A6=0.	MPT22190
	A7=0.	MPT22200
	C5=AN*THL	MPT22210
	CC=CA-C5	MPT22220
	CD=CB-C5	MPT22230
	CE=CA+C5	MPT22240
	CF=CB+C5	MPT22250
	C6=CC*CC/C2	MPT22260
	C7=CD*CD/C2	MPT22270
	C8=CE*CE/C2	MPT22280
	C9=CF*CF/C2	MPT22290
	IF (C6.GE.50.) GO TO 300	MPT22300
300	A4=1./EXP(C6)	MPT22310
	IF (C7.GE.50.) GO TO 320	MPT22320
320	A5=1./EXP(C7)	MPT22330
	IF (C8.GE.50.) GO TO 340	MPT22340
340	A6=1./EXP(C8)	MPT22350
	IF (C9.GE.50.) GO TO 360	MPT22360
360	A7=1./EXP(C9)	MPT22370
	T=A4+A5+A6+A7	MPT22380
	SUM=SUM+T	MPT22390
	IF (T.GE.0.01) GO TO 280	MPT22400

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RC=A1*(A2+A3+SUM)
RETURN
C
C-->-->-->SECTION RCP.G - UNSTABLE, CALCULATE MULTIPLE EDDY
C REFLECTIONS, Z IS ZERO.
C
C CALCULATE MULTIPLE EDDY REFLECTIONS FOR GROUND LEVEL RECEPTOR
C HEIGHT.
380 A1=1./(6.28318*UPL*SY*SZ*C1)
A2=0.
C2=2.*SZ*SZ
C3=H*H/C2
IF (C3.GE.50.) GO TO 400
A2=2./EXP(C3)
400 SUM=0.
THL=2.*HL
410 AN=AN+1.
A4=0.
A6=0.
C5=AN*THL
CC=H-C5
CE=H+C5
C6=CC*CC/C2
C8=CE*CE/C2
IF (C6.GE.50.) GO TO 430
A4=2./EXP(C6)
430 IF (C8.GE.50.) GO TO 450
A6=2./EXP(C8)
450 T=A4+A6
SUM=SUM+T
IF (T.GE.0.01) GO TO 410
RC=A1*(A2+SUM)
RETURN
C
C-->-->-->SECTION RCP.H - FORMAT
C
C*** SECTIONS OF SUBROUTINE RCP.
C SECTION RCP.A - COMMON.
C SECTION RCP.B - EXPLANATIONS AND COMPUTATIONS COMMON TO ALL
C CONDITIONS.
C SECTION RCP.C - STABLE OR UNLIMITED MIXING, Z IS ZERO.
C SECTION RCP.D - STABLE OR UNLIMITED MIXING, Z IS NON-ZERO.
C SECTION RCP.E - UNSTABLE, ASSURED OF UNIFORM MIXING.
C SECTION RCP.F - UNSTABLE, CALCULATE MULTIPLE EDDY
C REFLECTIONS; Z IS NON-ZERO.
C SECTION RCP.G - UNSTABLE, CALCULATE MULTIPLE EDDY
C REFLECTIONS; Z IS ZERO.
C SECTION RCP.H - FORMAT.
470 FORMAT (1H0,'BOTH H AND Z ARE ABOVE THE MIXING HEIGHT SO A RELIABLE
C COMPUTATION CAN NOT BE MADE.')
C
C END
C
C SUBROUTINE PGYZ
C SUBROUTINE PGYZ (VERSION 79365), PART OF MPTER.
C VERTICAL DISPERSION PARAMETER VALUE, SZ DETERMINED BY
C SZ = A * X ** B WHERE A AND B ARE FUNCTIONS OF BOTH STABILITY
C AND RANGE OF X.
C HORIZONTAL DISPERSION PARAMETER VALUE, SY DETERMINED BY
C LOGARITHMIC INTERPOLATION OF PLUME HALF-ANGLE ACCORDING TO
C DISTANCE AND CALCULATION OF 1/2.15 TIMES HALF-ARC LENGTH.
C COMMON /MPR/ UPL,Z,H,HL,X,Y,KST,DELH,SY,SZ,RC,MUOR
C DIMENSION XA(7),XB(2),XD(5),XE(8),XF(9),AA(8),BA(8),AB(3),
C IBB(3),AD(6),BD(6),AE(9),BE(9),AF(10),BF(10)
C DATA XA /5.,4.,3.,25.,2.,15.,1/
C DATA XB /4.,2/
C DATA XD /30.,10.,3.,1.,3/
C DATA XE /40.,20.,10.,4.,2.,1.,3.,1/
C DATA XF /60.,30.,15.,7.,3.,2.,1.,7.,2/

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MPT22410
MPT22420
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MPT22990
MPT23000
MPT23010
MPT23020
MPT23030
MPT23040
MPT23050
MPT23060
MPT23070
MPT23080
MPT23090
MPT23100

	DATA AA /453.85,346.75,258.89,217.41,179.52,170.22,158.08,122.8/	MPT23110
	DATA BA /2.1166,1.7283,1.4094,1.2644,1.1262,1.0932,1.0542,.9447/	MPT23120
	DATA AB /109.30,98.483,90.673/	MPT23130
	DATA BB /1.0971,0.98332,0.93198/	MPT23140
	DATA AD /44.053,36.650,33.504,32.093,32.093,34.459/	MPT23150
	DATA BD /0.51179,0.56589,0.60486,0.64403,0.81066,0.86974/	MPT23160
	DATA AE /47.618,35.420,26.970,24.703,22.534,21.628,21.628,23.331,21.26/	MPT23170
	DATA BE /0.29592,0.37615,0.46713,0.50527,0.57154,0.63077,0.75660,0.81956,0.8366/	MPT23180
	DATA AF /34.219,27.074,22.651,17.836,16.187,14.823,13.953,13.953,14.457,15.209/	MPT23190
	DATA BF /0.21716,0.27436,0.32681,0.41507,0.46490,0.54503,0.63227,0.68465,0.78407,0.81558/	MPT23200
C	IF (MUOR.EQ.2) GO TO 9	MPT23210
C		MPT23220
C	MCELROY-POOLER URBAN DISPERSION PARAMETERS FROM ST. LOUIS	MPT23230
C	EXPERIMENT AS PUT IN EQUATION FORM BY BRIGGS.	MPT23240
C	X IS DISTANCE IN KM.	MPT23250
C	KST IS PASQUILL STABILITY CLASS.	MPT23260
C	SY AND SZ ARE IN METERS.	MPT23270
2	GO TO (2,2,3,4,5,5), KST	MPT23280
	SY=320.*X/SQRT(1.+0.4*X)	MPT23290
	SZ=240.*X/SQRT(1.+X)	MPT23300
3	GO TO 6	MPT23310
	SY=220.*X/SQRT(1.+0.4*X)	MPT23320
	SZ=200.*X	MPT23330
4	GO TO 6	MPT23340
	SY=160.*X/SQRT(1.+0.4*X)	MPT23350
	SZ=140.*X/SQRT(1.+0.3*X)	MPT23360
5	GO TO 6	MPT23370
	SY=110.*X/SQRT(1.+0.4*X)	MPT23380
	SZ=80.*X/SQRT(1.+1.5*X)	MPT23390
6	IF (SZ.GT.5000.) SZ=5000.	MPT23400
C	RETURN	MPT23410
9	XY=X	MPT23420
	GO TO (10,40,70,80,110,140), KST	MPT23430
C	STABILITY A	MPT23440
10	TH=(24.167-2.5334*ALOG(XY))/57.2958	MPT23450
	IF (X.GT.3.11) GO TO 170	MPT23460
	DO 20 ID=1,7	MPT23470
	IF (X.GE.XA(ID)) GO TO 30	MPT23480
20	CONTINUE	MPT23490
	ID=8	MPT23500
30	SZ=AA(ID)*X**BA(ID)	MPT23510
	GO TO 190	MPT23520
C	STABILITY B	MPT23530
40	TH=(18.333-1.8096*ALOG(XY))/57.2958	MPT23540
	IF (X.GT.35.) GO TO 170	MPT23550
	DO 50 ID=1,2	MPT23560
	IF (X.GE.XB(ID)) GO TO 60	MPT23570
50	CONTINUE	MPT23580
	ID=3	MPT23590
60	SZ=AB(ID)*X**BB(ID)	MPT23600
	GO TO 180	MPT23610
C	STABILITY C	MPT23620
70	TH=(12.5-1.0857*ALOG(XY))/57.2958	MPT23630
	SZ=61.141*X**0.91465	MPT23640
	GO TO 180	MPT23650
C	STABILITY D	MPT23660
80	TH=(8.3333-0.72382*ALOG(XY))/57.2958	MPT23670
	DO 90 ID=1,5	MPT23680
	IF (X.GE.XD(ID)) GO TO 100	MPT23690
90	CONTINUE	MPT23700
	ID=6	MPT23710
100	SZ=AD(ID)*X**BD(ID)	MPT23720
	GO TO 180	MPT23730
C	STABILITY E	MPT23740
		MPT23750
		MPT23760
		MPT23770
		MPT23780
		MPT23790
		MPT23800

110	TH=(6.25-0.54287*ALOG(XY))/57.2958	MPT23810
	DO 120 ID=1,8	MPT23820
	IF (X.GE.XE(ID)) GO TO 130	MPT23830
120	CONTINUE	MPT23840
	ID=9	MPT23850
130	SZ=AE(ID)*X**BE(ID)	MPT23860
	GO TO 180	MPT23870
C	STABILITY F	MPT23880
140	TH=(4.1667-0.36191*ALOG(XY))/57.2958	MPT23890
	DO 150 ID=1,9	MPT23900
	IF (X.GE.XF(ID)) GO TO 160	MPT23910
150	CONTINUE	MPT23920
	ID=10	MPT23930
160	SZ=AF(ID)*X**BF(ID)	MPT23940
	GO TO 180	MPT23950
170	SZ=5000.	MPT23960
	GO TO 190	MPT23970
180	IF (SZ.GT.5000.) SZ=5000.	MPT23980
190	SY=465.116*XY*SIN(TH)/COS(TH)	MPT23990
C	465.116 = 1000. (M/KM) / 2.15	MPT24000
	RETURN	MPT24010
C	END	MPT24030
C	SUBROUTINE RANK (L)	MPT24040
C	SUBROUTINE RANK (VERSION 79365), PART OF MPTER.	MPT24050
C	CALLED BY MPTER TO ARRANGE CONCENTRATIONS OF VARIOUS AVG	MPT24060
C	TIMES INTO HIGH-FIVE TABLES...THAT IS, ARRAYS STORING	MPT24070
C	THE HIGHEST FIVE CONCENTRATIONS FOR EACH RECEPTOR FOR	MPT24080
C	EACH AVG TIME.	MPT24090
C	VARIABLES OUTPUT:	MPT24100
C	HMAXA(J,K,L) CONCENTRATIONS ACCORDING TO	MPT24110
C	J : RANK OF CONC. (1-5)	MPT24120
C	K : RECEPTOR NUMBER	MPT24130
C	L : AVG TIME	MPT24140
C	NDAY(J,K,L) : ASSOCIATED DAY OF CONC.	MPT24150
C	IHR(J,K,L) : ENDING HOUR OF CONC.	MPT24160
	COMMON/MR/HMAXA(5,180,5),NDAY(5,180,5),IHR(5,180,5),CONC(180,5),	MPT24170
1	JDAY,NR	MPT24180
	COMMON /MPO/ NRECEP, NAVG, NB, LH, NPT, IDATE(2), RREC(180), SREC(180), ZRMPT	MPT24190
	1(180), ELR(180), PHCHI(180), PHSIGS(180,26), HSAV(250), DSAV(250), PCHI	MPT24200
	2(180), PSIGS(180,26), IPOL	MPT24210
	IO=6	MPT24220
C	RESET AVERAGING PERIOD FLAG AND SET CALM FLAG, LL.	MPT24230
C	CALMS ACCOUNTED FOR ONLY WHEN DEFAULT OPTION ON.	MPT24240
	LL=0	MPT24250
	IF(L.GT.4)LL=1	MPT24260
	IF(L.EQ.22)L=2	MPT24270
	IF(L.EQ.33)L=3	MPT24280
	IF(L.EQ.44)L=4	MPT24290
	DO 50 K=1,NRECEP	MPT24300
	IF (CONC(K,L).LE.HMAXA(5,K,L)) GO TO 50	MPT24310
	DO 10 J=1,5	MPT24320
	IF (CONC(K,L).GT.HMAXA(J,K,L)) GO TO 20	MPT24330
C	CONCENTRATION IS ONE OF THE TOP FIVE	MPT24340
10	CONTINUE	MPT24350
	WRITE (IO,70)	MPT24360
	GO TO 50	MPT24370
C	THE FOLLOWING DO-LOOP HAS THE EFFECT OF INSERTING A NEW	MPT24380
C	CONCENTRATION ENTRY INTO ITS PROPER POSITION WHILE SHIFTING	MPT24390
C	DOWN THE 'OLD' LOWER CONCENTRATIONS THUS ESTABLISHING THE	MPT24400
C	'HIGH-FIVE' CONCENTRATION TABLE.	MPT24410
20	IF (J.EQ.5) GO TO 40	MPT24420
	DO 30 IJ=4,J,-1	MPT24430
	IJPI=IJ+1	MPT24440
	HMAXA(IJPI,K,L)=HMAXA(IJ,K,L)	MPT24450
	NDAY(IJPI,K,L) = NDAY(IJ,K,L)	MPT24460
30	IHR(IJPI,K,L) = IHR(IJ,K,L)	MPT24470
C	INSERT LATEST CONC, DAY AND ENDING HR INTO THE	MPT24480
C	PROPER RANK IN THE HIGH-FIVE TABLE	MPT24490
		MPT24500

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40  HMAXA(J,K,L)=CONC(K,L)
    NDAY(J,K,L) = JDAY
    IHR(J,K,L) = LH
C    ADD 100 TO HOUR TO SET CALM FLAG FOR MAIN.
50  IF(LL.EQ.1.AND.L.NE.1) IHR(J,K,L)=IHR(J,K,L)+100
    CONTINUE
    DO 60 K=1,NRECEP
    CONC(K,L)=0.
60  CONTINUE
    RETURN
C
70  FORMAT (1X,' ****ERROR IN FINDING THE MAX CONCENTRATION***')
C
    END
C
    SUBROUTINE OUTHR
C      SUBROUTINE OUTHR (VERSION 79365), PART OF MPTR.
C      THIS SUBROUTINE PROVIDES OUTPUT CONCENTRATIONS IN
C      MICROGRAMS PER CUBIC METER FOR EACH HOUR IN TWO WAYS:
C      1) CONTRIBUTIONS FROM SIGNIFICANT SOURCES, AND
C      2) SUMMARIES.
C      BEYOND ENTRY POINT OUTAVG THE SUBROUTINE PROVIDES
C      CONCENTRATION OUTPUT FOR EACH AVERAGING PERIOD AGAIN
C      IN THE ABOVE MANNER.
C-->-->-->SECTION OUTHR.A - COMMON, DIMENSION, AND DATA.
C
    COMMON /MPOR/ IOPT(25)
    COMMON /MPO/ NRECEP, NAVG, NB, LH, NPT, IDATE(2), RREC(180), SREC(180), ZRMPT24790
    1(180), ELR(180), PHCHI(180), PHSIGS(180,26), HSAV(250), DSAV(250), PCHI(MPT24800
    2(180), PSIGS(180,26), IPOL
    COMMON /MO/ QTHETA(24), QU(24), IKST(24), QHL(24), QTEMP(24), MPS(25), NMPT24820
    1SIGP, IO, LINE1(20), LINE2(20), LINE3(20), RNAME(2,180), IRANK(180), STARMPT24830
    2(5,180)
    DIMENSION IPOLT(2)
    DATA IPOLT /'SO2','PART'/
    IPOLU=IPOLT(1)
    IF (IPOL.EQ.4) IPOLU=IPOLT(2)
C    OPTION(11): PRINT ONLY THE HOURLY SUMMARIES.
    IF (IOPT(11).EQ.1) GO TO 100
C-->-->-->SECTION OUTHR.B - WRITE HOURLY CONTRIBUTION TITLE.
C
    WRITE (IO,350) LINE1,LINE2,LINE3
    WRITE (IO,360) IPOLU,IDATE,LH
C
C-->-->-->SECTION OUTHR.C - WRITE HOURLY MET DATA.
C
    IF (IOPT(12).EQ.1) GO TO 10
    WRITE (IO,450)
    WRITE (IO,460) LH,QTHETA(LH),QU(LH),QHL(LH),QTEMP(LH),IKST(LH)
C
C-->-->-->SECTION OUTHR.D - WRITE FINAL PLUME HEIGHT AND DISTANCE
C      FINAL RISE.
C
10  IF (IOPT(13).EQ.1) GO TO 20
    WRITE (IO,470) (I,I=1,10)
C    HSAV ARE THE CALCULATED PLUME HEIGHTS FOR THIS HOUR
    WRITE (IO,480) (HSAV(I),I=1,NPT)
    WRITE (IO,490) (DSAV(I),I=1,NPT)
C
C-->-->-->SECTION OUTHR.E - WRITE HRLY SIGNIFICANT SOURCE CONTRIB.
C
20  IF (NSIGP.GT.10) GO TO 40
    PRINT FIRST PAGE OF OUTPUT AND TOTALS FOR 10 OR LESS SIGNIF SOUR
    WRITE (IO,370)
    WRITE (IO,380) (I,I=1,NSIGP)
    WRITE (IO,390)
    WRITE (IO,380) (MPS(I),I=1,NSIGP)
    WRITE (IO,400)

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	DO 30 K=1,NRECEP	MPT25210
	WRITE (IO,410) K,STAR(1,K),STAR(2,K),(PHSIG(K,I),I=1,NSIGP)	MPT25220
C	PRINT TOTALS	MPT25230
	WRITE (IO,420) PHSIG(K,26),PHCHI(K)	MPT25240
30	CONTINUE	MPT25250
	GO TO 100	MPT25260
C	PRINT FIRST PAGE FOR MORE THAN 10 SIGNIFICANT SOURCES.	MPT25270
40	WRITE (IO,370)	MPT25280
	WRITE (IO,380) (I,I=1,10)	MPT25290
	WRITE (IO,430) (MPS(I),I=1,10)	MPT25300
	WRITE (IO,400)	MPT25310
	DO 50 K=1,NRECEP	MPT25320
50	WRITE (IO,410) K,STAR(1,K),STAR(2,K),(PHSIG(K,I),I=1,10)	MPT25330
	IF (NSIGP.GT.20) GO TO 70	MPT25340
C	PRINT SECOND PAGE AND TOTALS FOR 11 TO 20 SIGNIFICANT SOURCES	MPT25350
	WRITE (IO,350) LINE1,LINE2,LINE3	MPT25360
	WRITE (IO,360) IPOLU,IDATE,LH	MPT25370
	WRITE (IO,370)	MPT25380
	WRITE (IO,380) (I,I=11,NSIGP)	MPT25390
	WRITE (IO,390)	MPT25400
	WRITE (IO,380) (MPS(I),I=11,NSIGP)	MPT25410
	WRITE (IO,400)	MPT25420
	DO 60 K=1,NRECEP	MPT25430
60	WRITE (IO,410) K,STAR(1,K),STAR(2,K),(PHSIG(K,I),I=11,NSIGP)	MPT25440
	WRITE (IO,420) PHSIG(K,26),PHCHI(K)	MPT25450
	GO TO 100	MPT25460
C	WRITE SECOND PAGE FOR MORE THAN 20 SIGNIFICANT SOURCES.	MPT25470
70	WRITE (IO,350) LINE1,LINE2,LINE3	MPT25480
	WRITE (IO,360) IPOLU,IDATE,LH	MPT25490
	WRITE (IO,370)	MPT25500
	WRITE (IO,380) (I,I=11,20)	MPT25510
	WRITE (IO,430) (MPS(I),I=11,20)	MPT25520
	WRITE (IO,400)	MPT25530
	DO 80 K=1,NRECEP	MPT25540
80	WRITE (IO,410) K,STAR(1,K),STAR(2,K),(PHSIG(K,I),I=11,20)	MPT25550
	WRITE (IO,350) LINE1,LINE2,LINE3	MPT25560
	WRITE (IO,360) IPOLU,IDATE,LH	MPT25570
	WRITE (IO,370)	MPT25580
C	WRITE LAST PAGE AND TOTALS FOR MORE THAN 20 SIGNIF. SOURCES.	MPT25590
	WRITE (IO,380) (I,I=21,NSIGP)	MPT25600
	WRITE (IO,390)	MPT25610
	WRITE (IO,380) (MPS(I),I=21,NSIGP)	MPT25620
	WRITE (IO,400)	MPT25630
	DO 90 K=1,NRECEP	MPT25640
	WRITE (IO,410) K,STAR(1,K),STAR(2,K),(PHSIG(K,I),I=21,NSIGP)	MPT25650
90	WRITE (IO,420) PHSIG(K,26),PHCHI(K)	MPT25660
C	OPTION(14): SKIP OUTPUT OF THE HOURLY SUMMARIES.	MPT25670
100	IF (IOPT(14).EQ.1) GO TO 170	MPT25680
C		MPT25690
C-->-->-->	SECTION OUTHR.F - WRITE HOURLY SUMMARY TITLE.	MPT25700
C		MPT25710
	WRITE (IO,350) LINE1,LINE2,LINE3	MPT25720
	WRITE (IO,440) IPOLU,IDATE,LH	MPT25730
C		MPT25740
C-->-->-->	SECTION OUTHR.G - WRITE HOURLY MET DATA.	MPT25750
C		MPT25760
	IF (IOPT(15).EQ.1) GO TO 110	MPT25770
	WRITE (IO,450)	MPT25780
	WRITE (IO,460) LH,QTHETA(LH),QU(LH),QHL(LH),QTEMP(LH),IKST(LH)	MPT25790
C		MPT25800
C-->-->-->	SECTION OUTHR.H - WRITE FINAL PLUME HEIGHT AND	MPT25810
C	DISTANCE TO FINAL RISE.	MPT25820
110		MPT25830
	IF (IOPT(16).EQ.1) GO TO 120	MPT25840
	WRITE (IO,470) (I,I=1,10)	MPT25850
C	HSAV ARE THE CALCULATED PLUME HEIGHTS FOR THIS HOUR	MPT25860
	WRITE (IO,480) (HSAV(I),I=1,NPT)	MPT25870
	WRITE (IO,490) (DSAV(I),I=1,NPT)	MPT25880
C		MPT25890
C-->-->-->	SECTION OUTHR.I - WRITE HOURLY SUMMARY TABLE.	MPT25900

C	120	WRITE (10,500)	MPT25910
C		CALCULATE GRAND TOTALS AND RANK CONCENTRATIONS	MPT25920
	DO 130	K=1,NRECEP	MPT25930
C		HSAV IS USED AS A DUMMY VARIABLE FOR THE REMAINDER OF THIS	MPT25940
C		SUBROUTINE. IT IS ZEROED AGAIN IN PTR BEFORE ITS NORMAL USE.	MPT25950
130		HSAV(K)=PHCHI(K)	MPT25960
C		DETERMINE RANKING ACCORDING TO CONCENTRATION	MPT25970
	DO 150	I=1,NRECEP	MPT25980
		CMAX=-1.0	MPT25990
	DO 140	K=1,NRECEP	MPT26000
		IF (HSAV(K).LE.CMAX) GO TO 140	MPT26010
		CMAX=HSAV(K)	MPT26020
		IMAX=K	MPT26030
140		CONTINUE	MPT26040
		IRANK(IMAX)=I	MPT26050
		HSAV(IMAX)=-1.0	MPT26060
150		CONTINUE	MPT26070
	DO 160	K=1,NRECEP	MPT26080
		WRITE (10,510) K,STAR(1,K),STAR(2,K),(RNAME(J,K),J=1,2),RREC(K),SRMPT	MPT26090
160		LEC(K),ZR(K),ELR(K),PHSIGS(K,26),PHCHI(K),IRANK(K)	MPT26100
170		CONTINUE	MPT26110
		RETURN	MPT26120
C			MPT26130
C-->-->-->		SECTION OUTHR.J - ENTRY POINT FOR AVERAGING TIME	MPT26140
C			MPT26150
		ENTRY OUTAVG	MPT26160
C		AT THIS ENTRY POINT, CONCENTRATION OUTPUT	MPT26170
C		IN MICROGRAMS PER CUBIC METER ARE PRINTED FOR THE	MPT26180
C		AVERAGING PERIOD. CONTRIBUTIONS AND/OR SUMMARY	MPT26190
C		INFORMATION IS AVAILABLE.	MPT26200
C		AVERAGE CONCENTRATIONS OVER SPECIFIED TIME PERIOD	MPT26210
	DO 190	K=1,NRECEP	MPT26220
		PCHI(K)=PCHI(K)/NAVG	MPT26230
		HSAV(K)=PCHI(K)	MPT26240
	DO 180	I=1,26	MPT26250
180		PSIGS(K,I)=PSIGS(K,I)/NAVG	MPT26260
190		CONTINUE	MPT26270
C		OPTION(17): SKIP OUTPUT OF THE AVERAGED CONTRIBUTIONS.	MPT26280
		IF (IOPT(17).EQ.1) GO TO 270	MPT26290
C-->-->-->		SECTION OUTHR.K - WRITE AVERAGING-TIME SIGNIFICANT	MPT26300
C		SOURCE CONTRIBUTIONS.	MPT26310
	WRITE (10,350)	LINE1,LINE2,LINE3	MPT26320
	WRITE (10,520)	NAVG,IPOLU,IDATE,NB	MPT26330
	IF (NSIGP.GT.10)	GO TO 210	MPT26340
C		PRINT FIRST PAGE OF OUTPUT AND TOTALS FOR 10 OR LESS SIGNIF SOURCES	MPT26350
	WRITE (10,380)	(I,I=1,NSIGP)	MPT26360
	WRITE (10,390)		MPT26370
	WRITE (10,380)	(MPS(I),I=1,NSIGP)	MPT26380
	WRITE (10,400)		MPT26390
	DO 200	K=1,NRECEP	MPT26400
		WRITE (10,410) K,STAR(1,K),STAR(2,K),(PSIGS(K,I),I=1,NSIGP)	MPT26410
C		PRINT TOTALS	MPT26420
	WRITE (10,420)	PSIGS(K,26),PCHI(K)	MPT26430
200		CONTINUE	MPT26440
		GO TO 270	MPT26450
C		PRINT FIRST PAGE FOR MORE THAN 10 SIGNIF SOURCES	MPT26460
210		WRITE (10,380) (I,I=1,10)	MPT26470
	WRITE (10,430)	(MPS(I),I=1,10)	MPT26480
	WRITE (10,400)		MPT26490
	DO 220	K=1,NRECEP	MPT26500
220		WRITE (10,410) K,STAR(1,K),STAR(2,K),(PSIGS(K,I),I=1,10)	MPT26510
	IF (NSIGP.GT.20)	GO TO 240	MPT26520
C		PRINT SECOND PAGE AND TOTALS FOR 11 TO 20 SIGNIF SOURCES	MPT26530
	WRITE (10,350)	LINE1,LINE2,LINE3	MPT26540
	WRITE (10,520)	NAVG,IPOLU,IDATE,NB	MPT26550
	WRITE (10,380)	(I,I=11,NSIGP)	MPT26560
	WRITE (10,390)		MPT26570
	WRITE (10,380)	(MPS(I),I=11,NSIGP)	MPT26580
	WRITE (10,400)		MPT26590
			MPT26600

	DO 230 K=1,NRECEP	
	WRITE (IO,410) K,STAR(1,K),STAR(2,K),(PSIGS(K,I),I=11,NSIGP)	MPT26610
230	WRITE (IO,420) PSIGS(K,26),PCHI(K)	MPT26620
	GO TO 270	MPT26630
C	WRITE SECOND PAGE FOR MORE THAN 20 SIGNIF SOURCES	MPT26640
240	WRITE (IO,350) LINE1,LINE2,LINE3	MPT26650
	WRITE (IO,520) NAVG,IPOLU,IDATE,NB	MPT26660
	WRITE (IO,380) (I,I=11,20)	MPT26670
	WRITE (IO,430) (MPS(I),I=11,20)	MPT26680
	WRITE (IO,400)	MPT26690
	DO 250 K=1,NRECEP	MPT26700
250	WRITE (IO,410) K,STAR(1,K),STAR(2,K),(PSIGS(K,I),I=11,20)	MPT26710
	WRITE (IO,350) LINE1,LINE2,LINE3	MPT26720
	WRITE (IO,520) NAVG,IPOLU,IDATE,NB	MPT26730
C	WRITE LAST PAGE AND TOTALS FOR MORE THAN 20 SIGNIF SOURCES	MPT26740
	WRITE (IO,380) (I,I=21,NSIGP)	MPT26750
	WRITE (IO,390)	MPT26760
	WRITE (IO,380) (MPS(I),I=21,NSIGP)	MPT26770
	WRITE (IO,400)	MPT26780
	DO 260 K=1,NRECEP	MPT26790
260	WRITE (IO,410) K,STAR(1,K),STAR(2,K),(PSIGS(K,I),I=21,NSIGP)	MPT26800
	WRITE (IO,420) PSIGS(K,26),PCHI(K)	MPT26810
C	C-->-->-->SECTION OUTHR.L - WRITE AVERAGING-TIME SUMMARY.	MPT26820
C		MPT26830
C	OPTION(18): SKIP OUTPUT OF THE AVERAGED SUMMARIES.	MPT26840
270	IF (IOPT(18).EQ.1) GO TO 310	MPT26850
	WRITE (IO,350) LINE1,LINE2,LINE3	MPT26860
	WRITE (IO,530) NAVG,IPOLU,IDATE,NB	MPT26870
	WRITE (IO,500)	MPT26880
C	CALCULATE GRAND TOTALS AND RANK CONCENTRATIONS	MPT26890
	DO 290 I=1,NRECEP	MPT26900
	CMAK=-1.0	MPT26910
	DO 280 K=1,NRECEP	MPT26920
	IF (HSAV(K).LE.CMAK) GO TO 280	MPT26930
	CMAK=HSAV(K)	MPT26940
	LMAK=K	MPT26950
280	CONTINUE	MPT26960
	IRANK(LMAK)=I	MPT26970
	HSAV(LMAK)=-1.0	MPT26980
290	CONTINUE	MPT26990
	DO 300 K=1,NRECEP	MPT27000
	WRITE (IO,510) K,STAR(1,K),STAR(2,K),(RNAME(J,K),J=1,2),RREC(K),SRMPT27010	MPT27020
	REC(K),ZR(K),ELR(K),PSIGS(K,26),PCHI(K),IRANK(K)	MPT27030
300	CONTINUE	MPT27040
310	IF (IOPT(24).EQ.0) GO TO 330	MPT27050
C	PUNCH CONCENTRATIONS FOR CONTOURING(MICROGRAMS/CUBIC METER)	MPT27060
C	RECEPTOR COORDINATES IN USER UNITS.	MPT27070
	DO 320 K=1,NRECEP	MPT27080
	GWU=PCHI(K)*1.0E+06	MPT27090
	WRITE (IO,540) RREC(K),SREC(K),GWU,K,ZR(K),ELR(K)	MPT27100
	WRITE (1,540) RREC(K),SREC(K),GWU,K,ZR(K),ELR(K)	MPT27110
320	CONTINUE	MPT27120
330	IF (IOPT(23).EQ.0) GO TO 340	MPT27130
C	WRITE PERIODIC CONC. TO DISK/TAPE - FOR LONG-TERM APPLICATION	MPT27140
C	FOR EACH RUN, THIS WRITE STATEMENT WILL GENERATE	MPT27150
C	'NPER' RECORDS.	MPT27160
	WRITE (13) IDATE(2),NB,(PCHI(K),K=1,NRECEP)	MPT27170
340	RETURN	MPT27180
C	C-->-->-->SECTION OUTHR.M - FORMATS.	MPT27190
C		MPT27200
C***	SECTIONS OF SUBROUTINE OUTHR.	MPT27210
C	SECTION OUTHR.A - COMMON, DIMENSION, AND DATA.	MPT27220
C	SECTION OUTHR.B - WRITE HOURLY CONTRIBUTION TITLE.	MPT27230
C	SECTION OUTHR.C - WRITE HOURLY MET. DATA.	MPT27240
C	SECTION OUTHR.D - WRITE FINAL PLUME HEIGHT AND DISTANCE TO	MPT27250
C	FINAL RISE.	MPT27260
C	SECTION OUTHR.E - WRITE HOURLY SIGNIFICANT SOURCE CONTRIB.	MPT27270
C	SECTION OUTHR.F - WRITE HOURLY SUMMARY TITLE.	MPT27280
		MPT27290
		MPT27300

C	SECTION OUTHR.G -	WRITE HOURLY MET. DATA.	MPT27310
C	SECTION OUTHR.H -	WRITE FINAL PLUME HEIGHT AND DISTANCE TO	MPT27320
C		FINAL RISE.	MPT27330
C	SECTION OUTHR.I -	WRITE HOURLY SUMMARY TABLE.	MPT27340
C	SECTION OUTHR.J -	ENTRY POINT FOR AVERAGING TIME.	MPT27350
C	SECTION OUTHR.K -	WRITE AVERAGING-TIME SIGNIFICANT SOURCE	MPT27360
C		CONTRIBUTIONS.	MPT27370
C	SECTION OUTHR.L -	WRITE AVERAGING-TIME SUMMARY.	MPT27380
C	SECTION OUTHR.M -	FORMATS.	MPT27390
350	FORMAT ('1', 20A4/1X, 20A4/1X, 20A4)		MPT27400
360	FORMAT ('0', T30, A4, CONTRIBUTION(MICROGRAMS/M**3) FROM SIGNIFICANT		MPT27410
1	POINT SOURCES', 5X, I2, '/', I4, ' : HOUR ', I2//)		MPT27420
370	FORMAT (1H0, T5, 'RANK')		MPT27430
380	FORMAT ('+', T12, 10(I3, 7X))		MPT27440
390	FORMAT ('+', T113, 'TOTAL TOTAL'/1X, T113, 'SIGNIF ALL POINT'/1		MPT27450
400	1X, T113, 'POINT SOURCES'/1X, 'SOURCE #')		MPT27460
410	FORMAT (1X, 'RECEP #')		MPT27470
420	FORMAT (1X, I3, 2A1, 6P10F10.3)		MPT27480
430	FORMAT ('+', T109, 6P2F10.3)		MPT27490
440	FORMAT (1X, 'SOURCE #', T12, 10(I3, 7X))		MPT27500
15X, I2, '/', I4, ' : HOUR ', I2/1X)			MPT27510
450	FORMAT ('0', T25, A4, SUMMARY CONCENTRATION TABLE(MICROGRAMS/M**3)		MPT27520
11X, T9, ' (DEG) (M/S) HEIGHT(M) (K) MIXING TEMP STABILITY',			MPT27530
460	FORMAT (1X, T3, I2, 4F9.2, 6X, I1//)		MPT27540
470	FORMAT (13X, 10I11)		MPT27550
480	FORMAT (' FINAL HT (M) ', 10F11.2)		MPT27560
490	FORMAT (' DIST FIN HT (KM) ', 10F11.3)		MPT27570
500	FORMAT ('0', T7, 'RECEPTOR', T23, 'EAST', T33, 'NORTH', T43, 'RECEPTOR HT',		MPT27580
1, T61, 'RECEPTOR', T78, 'TOTAL FROM', T93, 'TOTAL FROM', T106, 'CONCENTRAT			MPT27590
21ON', '/', T7, 'NO. NAME', T22, 'COORD', T33, 'COORD', T44, 'ABV GRD (M)',			MPT27600
359, 'GRD-LVL ELEV', T77, 'SIGNIF POINT', T93, 'ALL SOURCES', T111, 'RANK',			MPT27610
4, '/', T58, '(USER HT UNITS)', T80, 'SOURCES', //)			MPT27620
510	FORMAT (1H, I8, 2A1, 2X, 2A4, 2F10.2, F12.1, F20.1, 6P2F15.4, I15)		MPT27630
520	FORMAT ('0', T22, I2, '-HOUR AVERAGE', A4, CONTRIBUTION(MICROGRAMS/M		MPT27640
1**3) FROM SIGNIFICANT POINT SOURCES', 5X, I2, '/', I3, ' START HOUR: '			MPT27650
2, I2//1X, T5, 'RANK')			MPT27660
530	FORMAT ('0', T25, I2, '-HOUR AVERAGE', A4, SUMMARY CONCENTRATION TAB		MPT27670
1LE(MICROGRAMS/M**3)', 5X, I2, '/', I3, ' START HOUR: ', I2//1X)			MPT27680
540	FORMAT ('CNTL', 1X, 3F10.3, 20X, I4, 2F10.1)		MPT27690
C			MPT27700
			MPT27710
			MPT27720
			MPT27730
	END		